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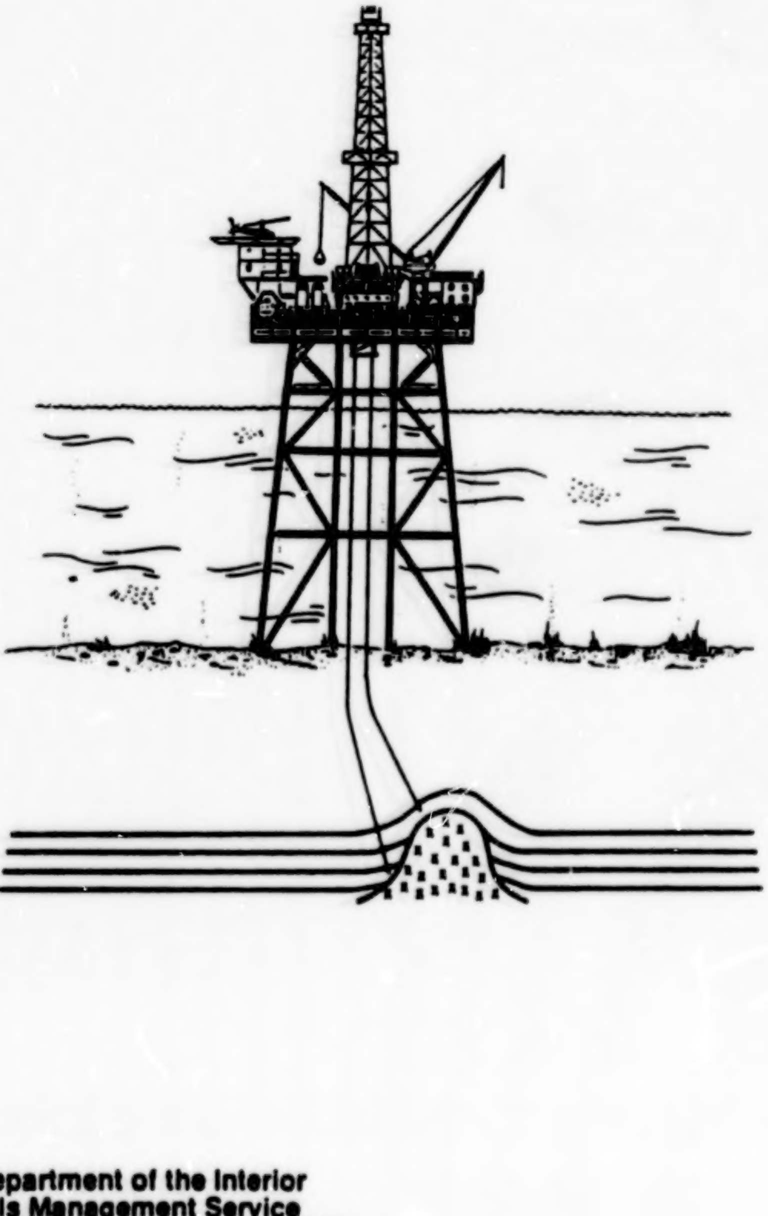
OCS Report
MMS 89-0074

Outer Continental Shelf

Estimated Oil and Gas Reserves, Gulf of Mexico, December 31, 1988



MMS
U.S. Department of the Interior
Minerals Management Service
Gulf of Mexico OCS Regional Office

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Estimated Oil and Gas Reserves, Gulf of Mexico, December 31, 1988

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U.S. Department of the Interior
Minerals Management Service
Gulf of Mexico OCS Regional Office

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New Orleans
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CONTENTS

Page

Abstract vii

Introduction 1

Definition of Reserve and Resource Terms 2

Reserves and Related Data Reported by Area 9

Reserves Reported by Geologic Age 19

Studies Conducted 30

Field-Size Distribution 31

Reservoir-Size Distribution 37

Production Rates and Discovery Trends 39

Summary 47

Conclusions 51

Appendix 53

References Cited 57

ILLUSTRATIONS

Figure

1. MMS petroleum resource classification 3
2. Gulf of Mexico MMS reserves classification procedure 4
3. Western Planning Area, Gulf of Mexico, Outer Continental Shelf 10
4. Central Planning Area, Gulf of Mexico, Outer Continental Shelf 11
5. Eastern Planning Area, Gulf of Mexico, Outer Continental Shelf 12
6. Major production trends by geologic age, Western and Central Planning Areas, Gulf of Mexico 20
7. Annual field discoveries by geologic age 28
8. Field-size distribution, 135 oil fields 32

Figure **Page**

9. Field-size distribution, 543 gas fields 32

10. Field-size distribution, 678 proved fields 32

11. Number of fields, rank order vs. percentage of total BOE recoverable reserves for 678 proved fields 34

12. Field and reserves distribution by water depth 35

13. Reservoir-size distribution, 828 combination reservoirs 38

14. Reservoir-size distribution, 4,959 oil reservoirs 38

15. Reservoir-size distribution, 7,031 gas reservoirs 38

16. Monthly production distribution, 3,601 oil completions, (2,590) continuously producing completions 40

17. Monthly production distribution, 3,000 gas completions, (1,885) continuously producing completions. 40

18. Annual oil and gas production 42

19. Reserves and production by discovery year 43

20. Number of fields and average reserves by discovery year 43

21. Oil reserves discovered and oil production 44

22. Gas reserves discovered and gas production 44

TABLES

Table

1. Estimated oil and gas reserves for 866 fields by area, Gulf of Mexico, Outer Continental Shelf, December 31, 1988 14

2. Status of oil and gas leases, boreholes, and completions by area, Gulf of Mexico, Outer Continental Shelf, December 31, 1988 15

3. Estimated oil and gas reserves for 678 proved fields by geologic age, Gulf of Mexico, Outer Continental Shelf, December 31, 1988 16

3a. Pleistocene estimated oil and gas reserves for 678 proved fields by area, Gulf of Mexico, Outer Continental Shelf, December 31, 1988 21

3b. Pliocene estimated oil and gas reserves for 678 proved fields by area, Gulf of Mexico, Outer Continental Shelf, December 31, 1988 22

Table | Page

3c. Upper Miocene estimated oil and gas reserves for 678 proved fields by area, Gulf of Mexico, Outer Continental Shelf, December 31, 1988 23

3d. Middle Miocene estimated oil and gas reserves for 678 proved fields by area, Gulf of Mexico, Outer Continental Shelf, December 31, 1988 24

3e. Lower Miocene estimated oil and gas reserves for 678 proved fields by area, Gulf of Mexico, Outer Continental Shelf, December 31, 1988 25

3f. Jurassic, Cretaceous, and Oligocene estimated oil and gas reserves for 678 proved fields by area, Gulf of Mexico, Outer Continental Shelf, December 31, 1988 26

4. Summary and comparison of oil and gas reserves as of December 31, 1987, and December 31, 1988 48

5. Estimated demonstrated oil and gas reserves at end of year, Gulf of Mexico, Outer Continental Shelf 50

A1. Estimated demonstrated oil and gas reserves for 866 fields by area, Gulf of Mexico, Outer Continental Shelf, December 31, 1988 54

A3. Estimated demonstrated oil and gas reserves for 744 fields by geologic age, Gulf of Mexico, Outer Continental Shelf, December 31, 1988 55

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Abstract

Remaining recoverable reserves of oil* and gas in the Gulf of Mexico Outer Continental Shelf (OCS) have been estimated to be 3.39 billion barrels of oil and 42.4 trillion cubic feet of gas, as of December 31, 1988. These reserves are recoverable from 632 proved fields located in Federal waters.

For any field contained partly in State waters and partly in Federal waters, reserves are estimated for the Federal portion only. An additional 163 fields have not been sufficiently developed to permit a reasonably accurate estimate of reserves.

Original recoverable reserves are estimated to have been 10.95 billion barrels of oil and 126.7 trillion cubic feet of gas from 678 proved fields in the same geographic area. Included in this number are 46 fields that are depleted and abandoned; not included are the 163 insufficiently developed fields. Estimates were made for individual reservoirs based on geologic mapping and reserve evaluation of 500 fields. Preliminary geologic studies were conducted for the remaining 178 fields.

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*The term "oil" as used in this report includes crude oil and condensate.

Introduction

This report, which supersedes Minerals Management Service (MMS) OCS Report MMS 88-0036 (Melancon and others, 1988), presents estimates of original recoverable reserves, cumulative production, and estimates of remaining recoverable reserves as of December 31, 1988, for the Gulf of Mexico. The estimates of reserves for this report were completed in April 1989 and represent the combined efforts of engineers, geologists, geophysicists, paleontologists, and other personnel of the MMS Gulf of Mexico Outer Continental Shelf (OCS) Regional Office in New Orleans, Louisiana.

As in previous reports (for example, Bryan and others, 1978), standard methods of estimating reserves were used, including volumetric calculation, decline curve analysis, material balance, and mathematical simulation.

Definition of Reserve and Resource Terms

Recently the Society of Petroleum Engineers (SPE) adopted a new set of reserve categories and definitions (SPE, May 1987). The MMS has also revised its definitions of resources (*Estimates of Undiscovered Conventional Oil and Gas Resources in the United States, A Summary*, U.S. Geological Survey and U.S. Minerals Management Service, In Press). In response to these changes the MMS Gulf of Mexico OCS Regional Office has modified its definitions of reserve and resource terms as in Figures 1 and 2. Reserves as of December 31, 1988, as reported in previous Minerals Management Service OCS reports, are presented in the Appendix to provide a transition to the new reserve definitions.

Undiscovered Resources

Resources, estimated from broad geologic knowledge and theory, existing outside of known fields or known accumulations are *undiscovered resources*. Undiscovered resources can exist in untested prospects — unleased acreage and undrilled leased acreage — or in known fields, where undiscovered resources occur in undiscovered pools that exist as unrelated accumulations controlled by distinctly separate structural features or stratigraphic conditions. *(Estimates of Undiscovered Conventional Oil and Gas Resources in the United States, A Summary.)*

Discovered Resources

Once leased acreage is drilled and qualifies under Title Code of Federal Regulations (CFR) 30 Part 250, Subpart A, Section 11, Determination of Well Producibility, the lease is considered to have *discovered resources*.

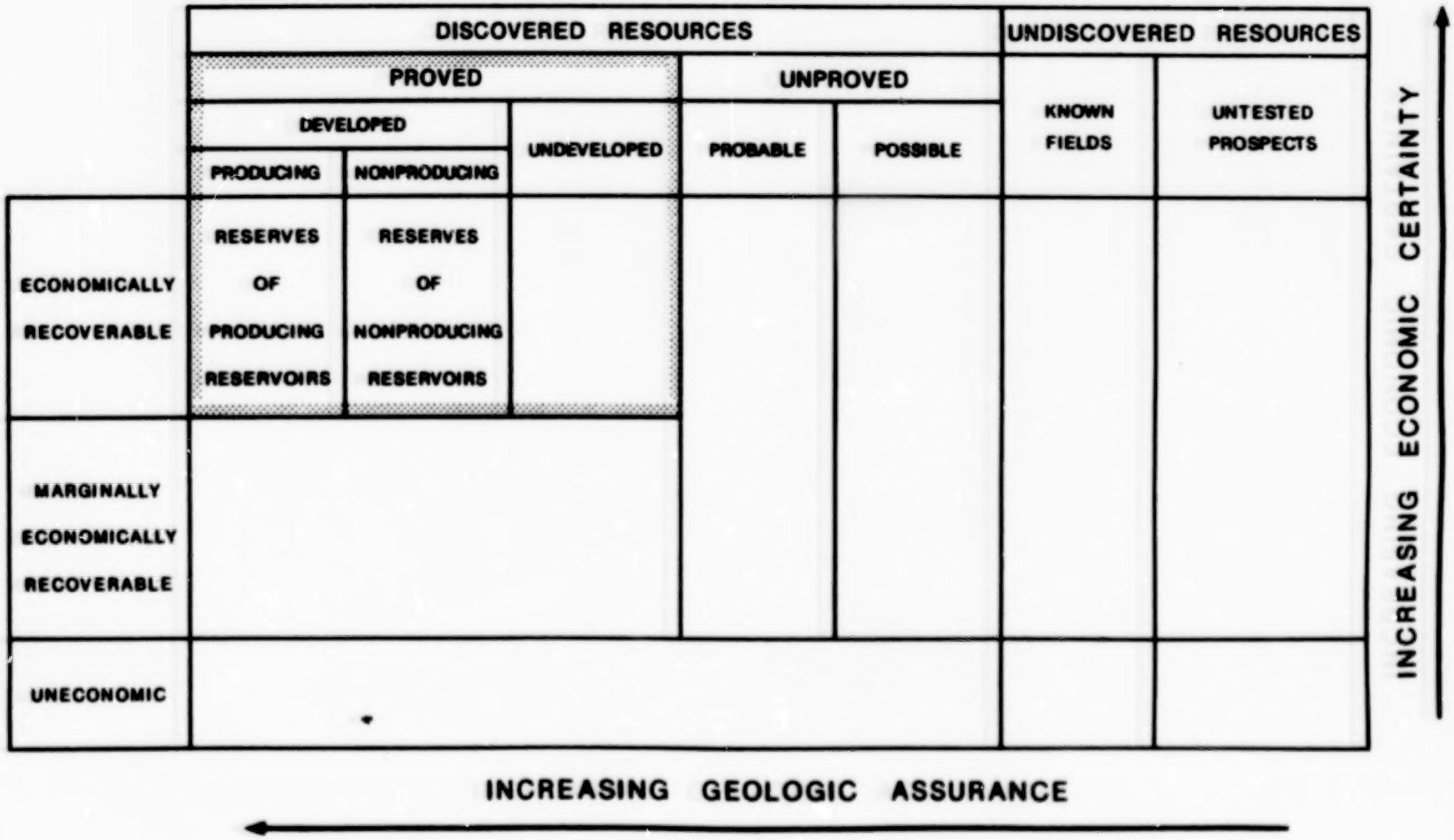
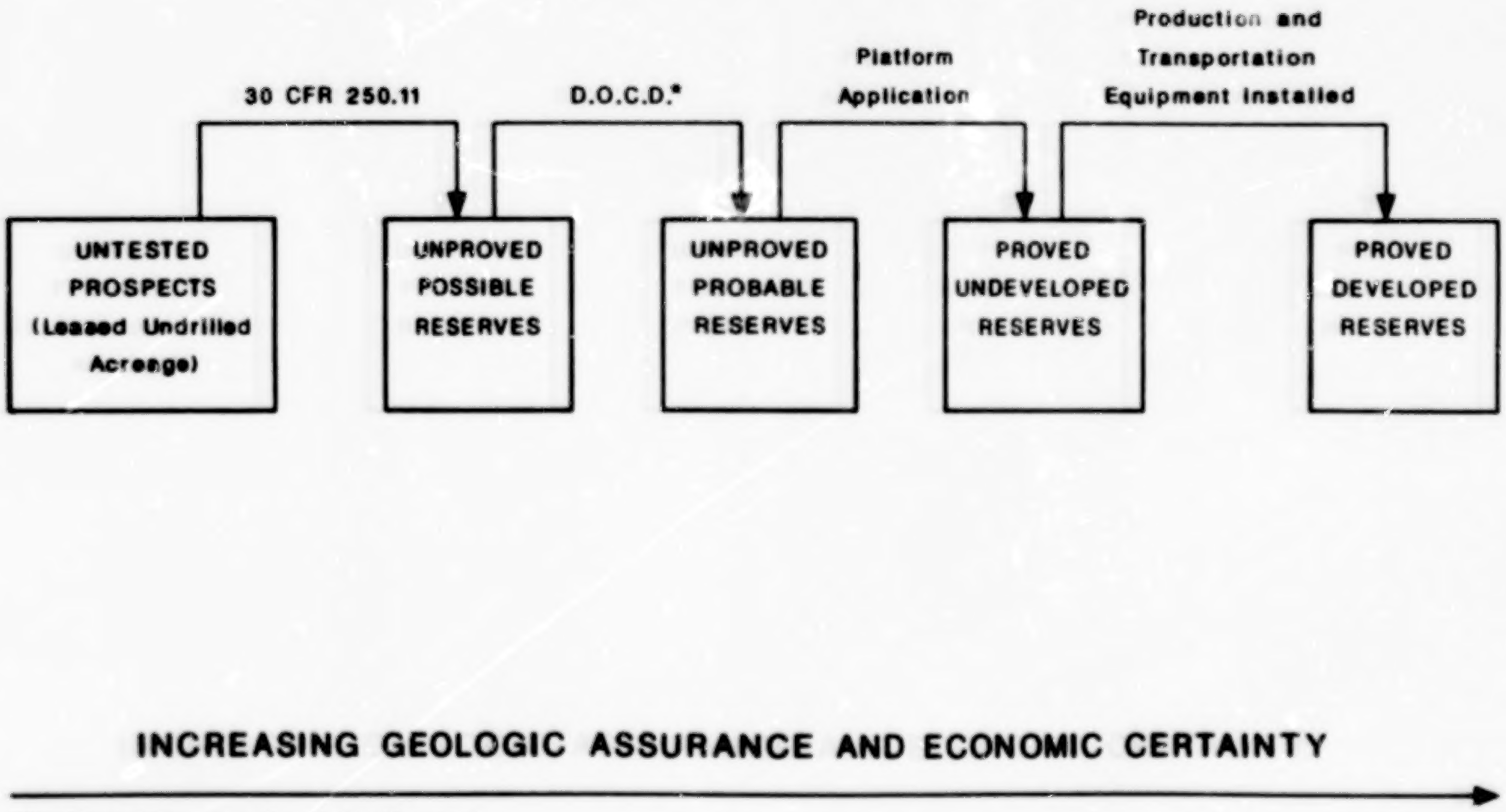


Figure 1.—MMS petroleum resource classification (modified from USGS, 1982, and SPE, 1987).


Production and Transportation Equipment Installed
Platform Application
30 CFR 250.11
D.O.C.D.*
UNTESTED PROSPECTS (Leased Undrilled Acreage)
UNPROVED POSSIBLE RESERVES
UNPROVED PROBABLE RESERVES
PROVED UNDEVELOPED RESERVES
PROVED DEVELOPED RESERVES
INCREASING GEOLOGIC ASSURANCE AND ECONOMIC CERTAINTY

*Development Operations Coordination Document

Figure 2.—Gulf of Mexico MMS reserves classification procedure.

Discovered resources are the equivalent of identified resources as reported by Dolton and others (1981, p. 6-7). Identified resources are resources whose location and quantity are known or are estimated from specific geologic evidence and that include economic, marginally economic, and subeconomic components. Discovered resources can be further characterized as unproved or proved reserves depending upon the evidence of economic accumulations.

Unproved Reserves

After a lease qualifies under 30 CFR 250.11, the MMS Field Naming Committee reviews the new producible lease to place the lease in an existing field or, if the lease is not associated with an established geologic structure, a new field. Regardless of whether the lease is assigned to an existing field or to a new field, the reserves associated with the lease are initially considered *unproved reserves*. Unproved reserves are based on geologic and/or engineering data similar to that used in estimates of proved reserves, but technical, contractual, economic, or regulatory uncertainties preclude such reserves being classified as proved.

Unproved reserves are not to be added to proved reserves because of different levels of uncertainty. For purposes of this publication, only proved reserves as highlighted in Figure 1 will be reported. Unproved reserves may be divided into two subclassifications, possible and probable, which are again based upon the level of uncertainty.

Unproved possible reserves are less certain than unproved probable reserves and can be estimated with a low degree of certainty, which is insufficient to indicate whether they are more likely to be recovered than not. Reservoir characteristics are such that a reasonable doubt exists that the project will be commercial (SPE, May 1987). After a lease qualifies under 30 CFR 250.11, the reserves associated with the lease are initially classified as unproved possible because the only direct evidence of economic accumulations is a production test or electric log analysis.

Unproved probable reserves are less certain than proved reserves and can be estimated with a degree of certainty sufficient to indicate they are more likely to be recovered than not (SPE, May 1987). Fields that have a significant, recent producible discovery or that have a Development Operations Coordination Document (DOCD) on file with MMS would be classified as unproved probable.

Proved Reserves

Proved reserves can be estimated with reasonable certainty to be recovered under current economic conditions. Current economic conditions include prices and costs prevailing at the time of the estimate. Proved reserves must either have facilities that are operational at the time of the estimate to process and transport those reserves to market, or a commitment or reasonable expectation to install such facilities in the future (SPE, May 1987). The application for a permit to install a platform is considered such a commitment. Proved reserves can be subdivided into undeveloped and developed.

Proved undeveloped reserves exist where there is a relatively large expenditure required to install production and/or transportation facilities, a commitment by the operator is made, and a time frame to begin production is established. Proved undeveloped reserves are reserves expected to be recovered from yet undrilled wells or from existing wells where a relatively large expenditure is required for recompletion.

Proved Developed Reserves. Reserves that are expected to be recovered from existing wells (including reserves behind pipe) are classified as *proved developed reserves*. Reserves are considered developed only after the necessary production and transportation equipment has been installed, or when the costs to do so are relatively minor. Proved developed reserves are subcategorized as producing or nonproducing (SPE, May 1987). This distinction is made at the reservoir level and not the field level.

Proved Developed Producing. Once the first reservoir in a field begins production, the reservoir is considered *proved developed producing*, and the field is considered on production. If a reservoir has produced any time during the 12 months before the reporting date, it is considered proved developed producing.

Proved Developed Nonproducing. Any developed reservoir in a developed field that has not produced during the previous 12 months from the reporting date is considered *proved developed nonproducing*. This category includes off-production reservoirs behind pipe and reservoirs awaiting workovers or transportation facilities.

Production data are the metered volumes of raw liquids and gas reported to the MMS by Federal lessees and operators. Oil volume measurements and reserves are corrected to reference standard conditions of 60°F and one atmosphere (14.696 pounds per square inch absolute [psia]); gas measurements and reserves are corrected to 60°F and 15.025 psia. To convert gas volumes to 14.696 psia, multiply by 1.022. Continuously measured volumes from production platforms and/or leases are allocated to individual wells and reservoirs on the basis of periodic well test *gauges*. These procedures introduce approximations in both production and reserves data by reservoirs and by fields.

Reserves and Related Data Reported by Area

The Gulf of Mexico has been divided into three planning areas for administrative purposes; these planning areas (Western, Central, and Eastern) are shown in Figures 3, 4, and 5, respectively. Each planning area is subdivided into smaller areas, which in turn are divided into numbered blocks. Fields in the Gulf of Mexico are identified by the smaller area name and block number of discovery — for example, East Cameron Block 271 Field. As the field is developed, the limits often expand into adjacent blocks and areas. These adjacent blocks are then identified as being part of the original field and are given that field name. Statistics in this report are presented as area totals compiled under each field name. All of the data associated with East Cameron Block 271 Field are therefore included in the East Cameron totals, even though part of the field extends into the adjacent area of Vermilion. There are four exceptions to the above field-naming techniques. These four fields and the area totals in which the field data are included are Tiger Shoal and Lighthouse Point, included in South Marsh Island; Coon Point, included in Ship Shoal; and Bay Marchand, included in South Timbalier.

On December 31, 1988, there were 795 active fields in the federally regulated part of the Gulf of Mexico, as listed by the MMS Gulf of Mexico Regional Field Names Committee. Of these, 632 were considered sufficiently developed to warrant estimation of reserves for this study. The remaining 163 were not sufficiently developed to permit a reasonably accurate estimate of reserves. In addition to the 632 active fields, 46 depleted fields (abandoned after production) are reported herein. This

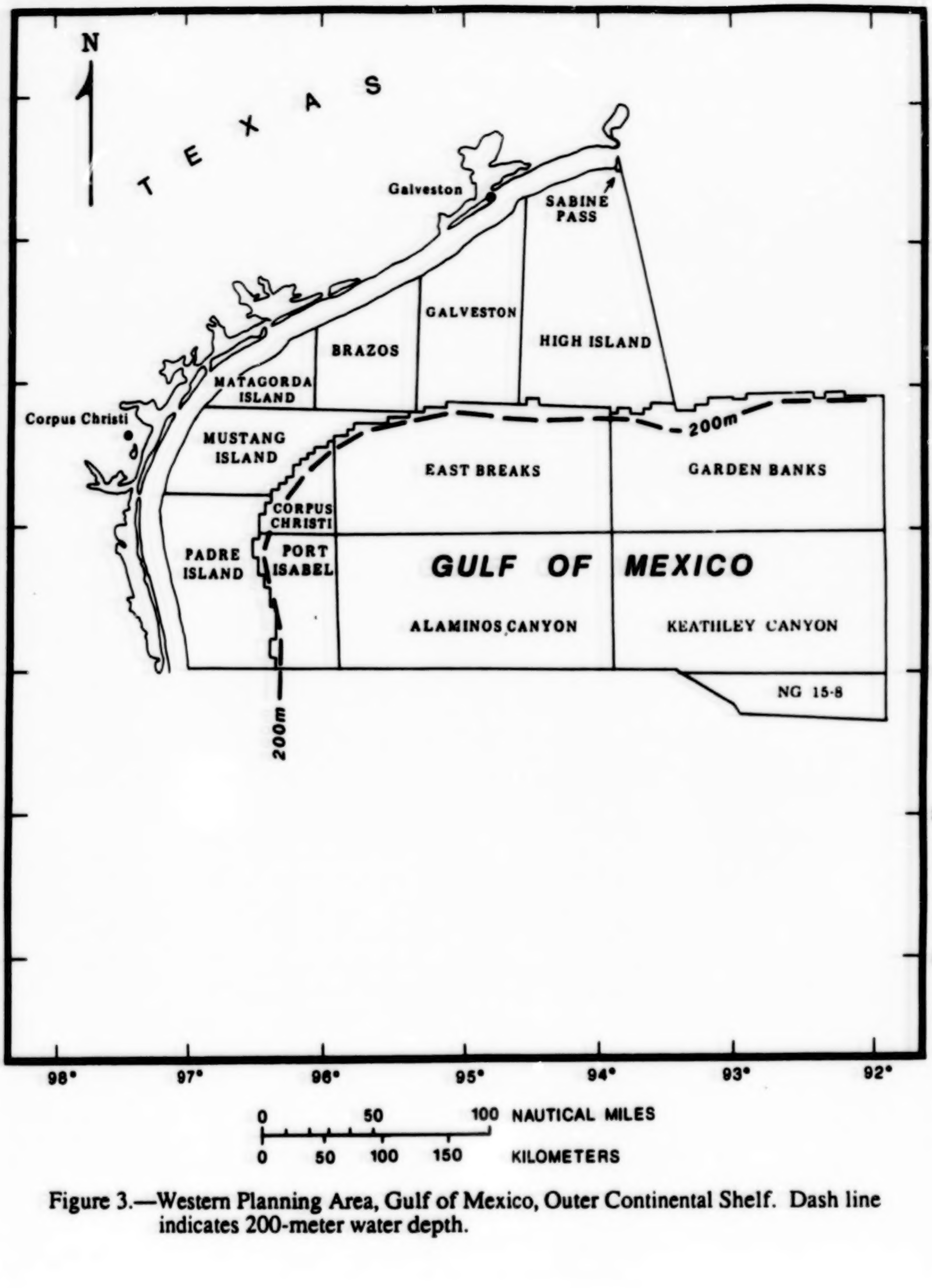


Figure 3.—Western Planning Area, Gulf of Mexico, Outer Continental Shelf. Dash line indicates 200-meter water depth.

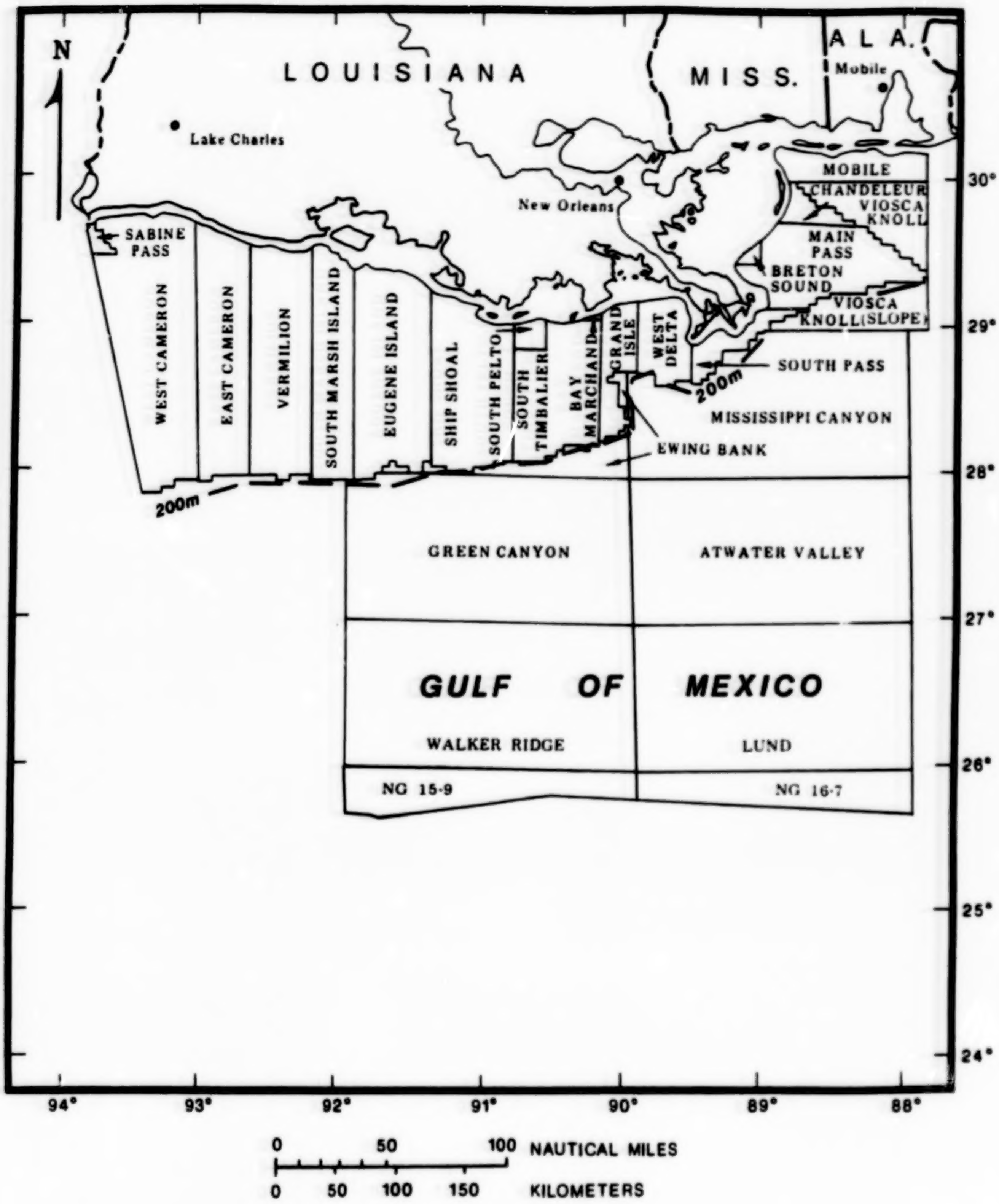


Figure 4.—Central Planning Area, Gulf of Mexico, Outer Continental Shelf. Dash line indicates 200-meter water depth.

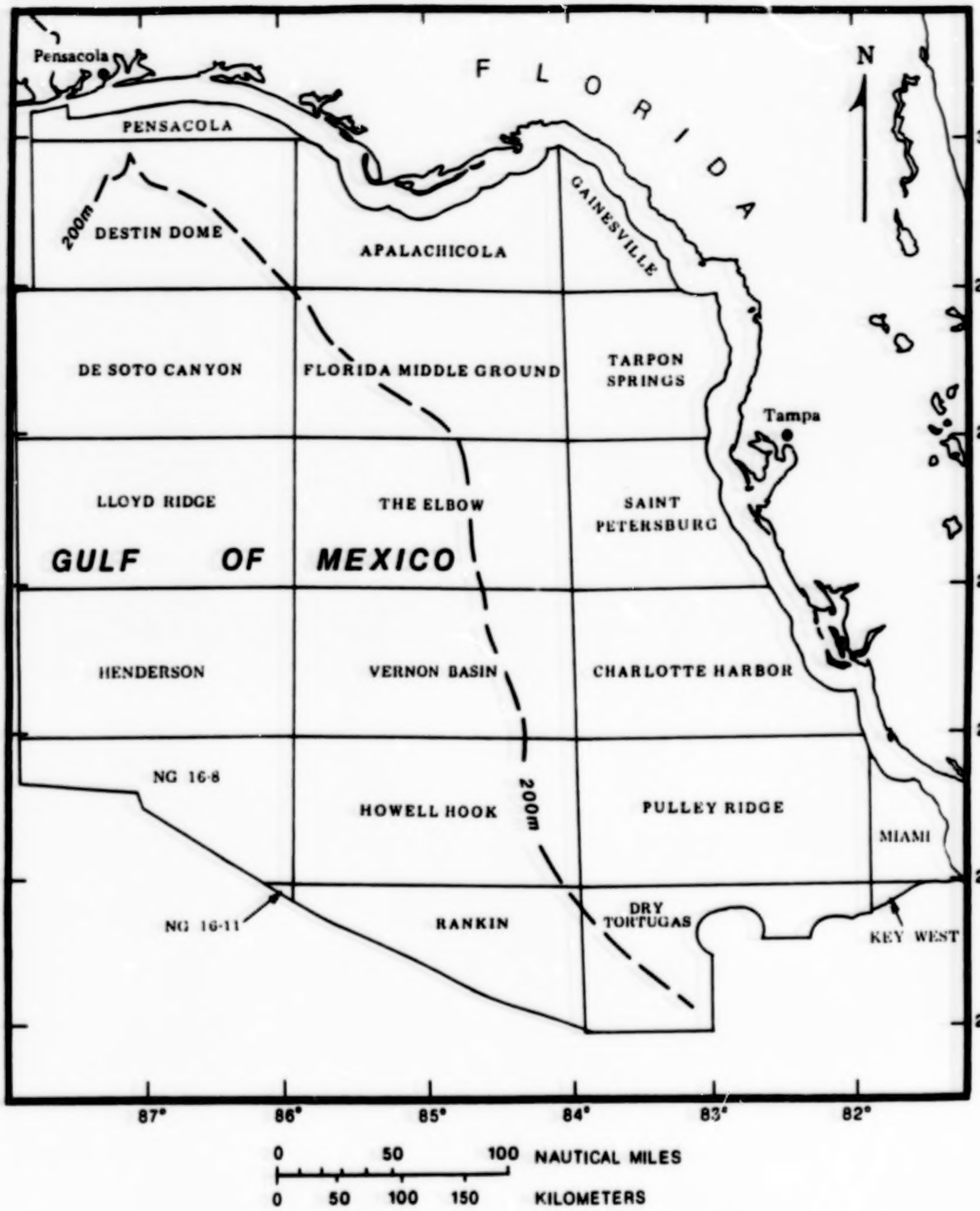


Figure 5.—Eastern Planning Area, Gulf of Mexico, Outer Continental Shelf. Dash line indicates 200-meter water depth.

makes a total of 678 fields for which oil and gas reserves were estimated. The 46 depleted fields are not included in the Regional Field Names Committee's 795 active fields, but are reported here to give a complete record of cumulative oil and gas production. In addition, there were 25 fields that expired in 1988 that had been classified as unproved. From the time these fields qualified under 30 CFR 250.11 until the leases were relinquished, there was not enough activity by the operator to classify these fields as proved. The modifications to the reserve inventory database required by the new definitions of reserve and resource terms now permit the tabulation of unproved expired fields. From 1980 through 1988, 75 unproved fields expired. Before 1980, records of unproved expired fields are incomplete.

Reserves data and various classifications of fields, leases, boreholes, and completions are presented as area totals in Tables 1, 2, and 3. Estimates of proved reserves for all proved active producing fields, as well as all proved active nonproducing fields, are presented as area totals in Table 1. The 678 fields studied (632 active fields and 46 depleted fields) constitute the current listing in the MMS Outer Continental Shelf Information System (OCSIS). The 163 unproved fields are not represented in the reserves data.

The statuses of Gulf of Mexico OCS Federal oil and gas leases issued as of December 31, 1988, are represented in Table 2. The 5,010 active leases and 3,427 relinquished leases are classified into one of two main groups, proved and unproved. Further subgrouping and definitions of the groups follow:

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Table 1. — Estimated oil and gas reserves for 866 fields by area, Gulf of Mexico, Outer Continental Shelf, December 31, 1988

(Proved reserves: oil expressed in millions of barrels at 60°F and 1 atm, gas in billions of cubic feet at 60°F and 15.025 psia.)

Area(s) (Figs. 3,4,and 5)	Number of Fields					Original recoverable reserves		Cumulative production through 1988		Remaining recoverable reserves	
	Proved active prod	Proved active nonprod	Proved expired depleted	Unproved active	Unproved expired 1988	Oil	Gas	Oil	Gas	Oil	Gas
Brazos	16	2	3	4	1	8	2,112	4	1,079	4	1,033
Galveston	20	5	1	2	2	32	1,272	21	822	11	450
High Island & Sabine Pass	75	7	4	19	0	330	12,260	156	7,179	174	5,081
Matagorda Island	12	8	0	6	0	34	5,103	5	1,082	29	4,021
Mustang Island & Padre Island	9	7	2	6	3	10	1,545	2	528	8	1,017
Western Slope[*]	5	0	0	12	1	38	710	12	64	26	646
Western Planning Area Subtotal	137	29	10	49	7	452	23,002	200	10,754	252	12,248
Chandeleur, Mobile & Viosca Knoll	4	16	0	11	1	1	988	0	157	1	831
East Cameron	36	5	7	10	2	244	8,594	172	6,505	72	2,089
Eugene Island	52	2	5	5	2	1,483	15,258	984	11,040	499	4,218
Grand Isle	10	0	3	2	0	908	3,845	757	3,102	151	743
Main Pass & Breton Sound	36	3	1	6	2	875	4,188	587	2,730	288	1,458
South Pelto	6	0	1	0	0	139	736	90	433	49	303
South Marsh Island	34	0	5	5	0	778	12,012	538	8,751	240	3,261
South Pass	9	1	0	2	0	938	2,754	666	1,884	272	870
Ship Shoal	45	4	3	5	1	1,294	10,771	889	7,722	405	3,049
South Timbalier	27	2	1	10	1	1,333	6,980	1,036	4,434	297	2,546
Vermilion	57	2	5	7	0	501	14,725	316	10,867	185	3,858
West Cameron & Sabine Pass	77	6	5	8	1	191	16,225	110	11,776	81	4,449
West Delta	17	2	0	3	0	1,231	4,632	1,027	3,481	204	1,151
Central Slope[**]	8	5	0	38	8	581	1,982	190	671	391	1,311
Central Planning Area Subtotal	418	48	36	112	18	10,497	103,690	7,362	73,553	3,135	30,137
Eastern Planning Area Subtotal[***]	0	0	0	2	0	0	0	0	0	0	0
GOM TOTAL	555	77	46	163	25	10,949	126,692	7,562	84,307	3,387	42,385
		678									

[*] Western Slope includes Alaminos Canyon, Corpus Christi, East Breaks, Garden Banks, Keathley Canyon, and Port Isabel.

[**] Central Slope includes Atwater Valley, Ewing Bank, Green Canyon, Mississippi Canyon, Viosca Knoll(slope), and Walker Ridge

[***] Eastern Planning Area includes Charlotte Harbor, Destin Dome, Pensacola, Pulley Ridge, and others.

Table 2. — Status of oil and gas leases, boreholes, and completions by area, Gulf of Mexico Outer Continental Shelf, December 31, 1988

Area(s) (Figs. 3, 4, and 5)	Number of leases studied Proved----		Number of leases			Number of boreholes		Number of active completions
	Active	Abandoned	Unproved qualified	Exploratory	Expired	Drilled	Abandoned	
Brazos	30	4	4	72	102	335	183	134
Galveston	38	4	2	113	237	372	260	126
High Island and Sabine Pass	174	19	18	231	344	1,987	970	997
Matagorda Island	50	1	6	43	54	353	131	171
Mustang Island and Padre Island	29	1	10	187	238	334	194	120
Western Slope*	14	0	13	437	148	227	143	73
Western Planning Area Subtotal	***335***	***29***	***53***	***1,083***	***1,123***	***3,608***	***1,881***	***1,621***
Chandeleur, Mobile, and Viosca Knoll	33	1	15	106	51	124	42	36
East Cameron	100	21	11	126	199	1,472	765	770
Eugene Island	170	33	8	81	183	3,300	1,525	1,939
Grand Isle	49	8	3	16	56	1,068	574	703
Main Pass and Breton Sound	106	11	7	86	158	1,705	644	1,304
Ship Shoal	138	16	6	81	171	2,532	1,179	1,592
South Marsh Island	91	13	6	63	108	1,910	810	1,152
South Pass	50	2	3	2	42	1,481	639	909
South Pelto	13	3	0	5	13	265	136	152
South Timbalier	104	7	13	63	172	2,015	773	1,467
Vermilion	150	24	10	76	218	1,996	987	1,072
West Cameron and Sabine Pass	215	33	10	133	312	2,261	1,149	1,190
West Delta	72	10	3	31	82	2,158	1,070	1,470
Central Slope**	38	0	57	858	175	785	484	249
Central Planning Area Subtotal	***1,329***	***182***	***152***	***1,727***	***1,940***	***23,072***	***10,777***	***14,005***
Eastern Planning Area Subtotal*	***0***	***0***	***2***	***329***	***153***	***39***	***36***	***0***
Total	***1,664***	***211***	***207***	***3,139***	***3,216***	***26,719***	***12,694***	***15,626***

* Western Slope includes Alaminos Canyon, Corpus Christi, East Breaks, Garden Banks, Keathley Canyon, and Port Isabel.

** Central Slope includes Atwater Valley, Ewing Bank, Green Canyon, Lund, Mississippi Canyon, Viosca Knoll (slope), and Walker Ridge.

*** Eastern Planning Area includes Charlotte Harbor, Destin Dome, Pensacola, Pulley Ridge, and others.

**** These numbers do not include active leases in studied, unproved fields.

Table 3. — Estimated demonstrated oil and gas reserves for 678 proved fields by geologic age, Gulf of Mexico, Outer Continental Shelf, December 31, 1988

(Proved reserves: oil expressed in millions of barrels at 60°F and 1 atm; gas in billions of cubic feet at 60°F and 15.025 psia)

Geologic Age	Original recoverable reserves		Cumulative production through 1988		Remaining recoverable reserves	
	Oil	Gas	Oil	Gas	Oil	Gas
Western Planning Area						
Pleistocene	335	9,435	151	5,118	184	4,317
Pliocene	1	128	0	66	1	62
Upper Miocene	8	713	2	404	6	309
Middle Miocene	57	6,929	34	3,689	23	3,240
Lower Miocene	51	5,795	13	1,477	38	4,318
Other*	0	2	0	0	0	2
Western Planning Area Subtotal	452	23,002	200	10,754	252	12,248
Central Planning Area						
Pleistocene	3,748	40,789	2,295	28,740	1,453	12,049
Pliocene	3,154	19,556	2,340	13,284	814	6,272
Upper Miocene	2,983	22,874	2,294	16,632	689	6,242
Middle Miocene	550	16,762	395	12,652	155	4,110
Lower Miocene	53	2,811	36	1,884	17	927
Other*	9	898	2	361	7	537
Central Planning Area Subtotal	10,497	103,690	7,362	73,553	3,135	30,137
Eastern Planning Area Subtotal	0	0	0	0	0	0
Total	10,949	126,692	7,562	84,307	3,387	42,385

*Other includes Jurassic, Cretaceous, and Oligocene

Proved Active **— Active leases within the designated 632 proved active fields presented in Table 1.**

Proved Abandoned **— Leases relinquished after oil and gas production. The leases associated with the 46 depleted fields are represented here along with other produced, relinquished leases that were once part of currently active fields. Expired leases without oil or gas production are classified as *expired* even though they were once part of a studied field.**

Unproved Qualified **— Leases associated with the 163 fields insufficiently developed for study. The leases have qualified as producible under 30 CFR 250.11, but the operators have not established a commitment to produce. These fields may be classified as unproved possible or unproved probable.**

Exploratory **— Active leases not yet qualified as producible or associated with any field.**

Expired **— Leases relinquished by the operator without having produced any oil or gas, even though some were once qualified producible under 30 CFR 250.11.**

Also shown in Table 2 are the total number of boreholes drilled and the number of those boreholes that have been plugged and abandoned in accordance with 30 CFR Part 250, Subpart G, Abandonment of Wells.

Because of reporting procedures, an accurate assessment of annual drilling activity cannot be obtained by comparisons of Table 2 borehole counts of successive years. There were 916 boreholes spudded during 1988, compared with 800 during 1987 and 654 during 1986. The last column of Table 2 presents the total number of active completions per area. Active completions are defined as those with perforations open to the formation and not isolated by permanent plugs; service wells (injection, disposal, or water source) are included. The presence or absence of production or injection is not considered. The number of boreholes and the number of active completions as of December 31, 1988, are based on reports received by MMS at the time the count was made in January 1989. These numbers may change when all data for 1988 have been received and processed.

Reserves Reported by Geologic Age

The reserves and production data of the 678 proved fields have been classified by geologic age of the reservoirs and are presented in Table 3. Age determinations were made by paleontological examinations of borehole cuttings where feasible. In areas with limited paleontological information, geologic ages were extrapolated from adjacent blocks with biostratigraphic control.

The generalized locations of the three major trends (Pleistocene, Pliocene, and Miocene) are shown in Figure 6. The Pleistocene-Pliocene boundary is considered to be younger than the *Buliminella* 1 biostratigraphic marker and older than the *Valvulineria* "H" biostratigraphic marker. The Pliocene-Miocene boundary is considered to be younger than the *Robulus* "E" biostratigraphic marker and older than the *Textularia* 6 biostratigraphic marker. Overlapping of adjacent trends occurs to varying degrees but has not been presented. Tables 3a through 3f present reserves and production data by geologic age for each area. In Table 3 reserves and production data for the Jurassic and Cretaceous Systems and Oligocene Series are combined and presented as *Other*.

In the Western Planning Area, reserves are predominantly gas. Forty-eight percent of gas production has come from the Pleistocene trend. Proved remaining reserves of gas in the Western Planning Area are concentrated in the lower Miocene of the Matagorda Island Area (30%)

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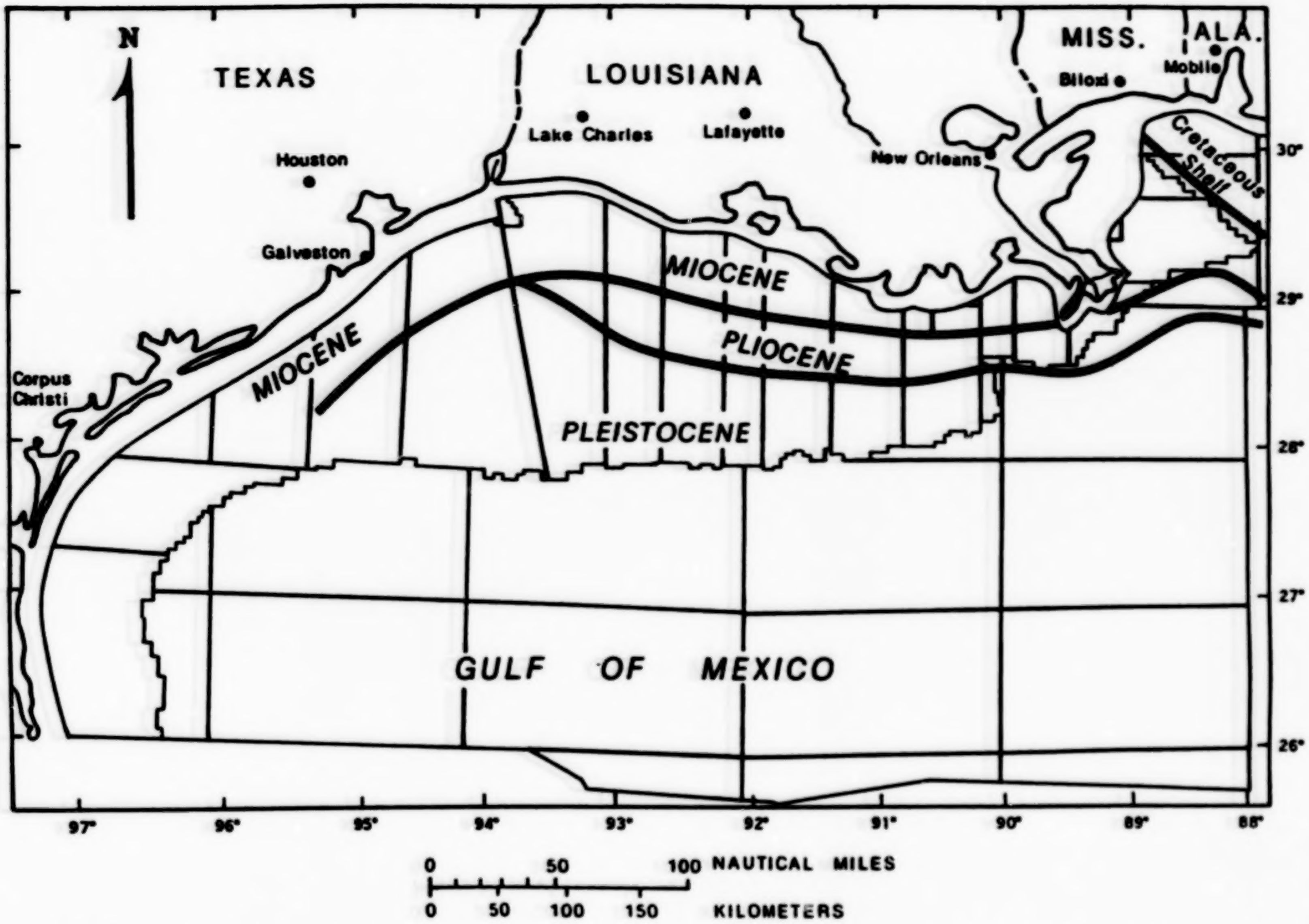

Figure 6.—Major production trends by geologic age, Western and Central Planning Areas, Gulf of Mexico.

Table 3a. — Pleistocene estimated oil and gas reserves for 678 proved fields by area, Gulf of Mexico, Outer Continental Shelf, December 31, 1988

(Proved reserves: oil expressed in millions of barrels at 60°F and 1 atm., gas in billions of cubic feet at 60°F and 15.025 psia.)

Area(s)	Number of reservoirs	Original recoverable reserves		Cumulative production through 1988		Remaining recoverable reserves	
		Oil	Gas	Oil	Gas	Oil	Gas
Galveston	17	0	97	0	46	0	51
High Island & Sabine Pass	989	297	8,630	139	5,008	158	3,622
Western Slope[*]	51	38	708	12	64	26	644
Western Planning Area Subtotal	1,057	335	9,435	151	5,118	184	4,317
East Cameron	468	170	4,141	120	2,999	50	1,142
Eugene Island	1,469	932	10,444	591	7,821	341	2,623
Grand Isle	97	7	1,241	6	1,041	1	200
Main Pass & Breton Sound	147	76	145	46	96	30	49
South Pelto	61	19	16	11	6	8	10
South Marsh Island	573	485	2,633	328	1,671	157	962
South Pass	198	161	411	78	255	83	156
Ship Shoal	1,198	792	6,212	564	4,579	228	1,633
South Timbalier	652	271	3,763	170	2,516	101	1,247
Vermilion	672	231	3,752	148	2,499	83	1,253
West Cameron & Sabine Pass	624	23	6,268	14	4,712	9	1,556
West Delta	65	77	414	71	270	6	144
Central Slope[**]	225	504	1,349	148	275	356	1,074
Central Planning Area Subtotal	6,449	3,748	40,789	2,295	28,740	1,453	12,049
Total	7,506	4,083	50,224	2,446	33,858	1,637	16,366

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[*] Western Slope includes Alaminos Canyon, Corpus Christi, East Breaks, Garden Banks, Keathley Canyon, and Port Isabel.

[**] Central Slope includes Atwater Valley, Ewing Bank, Green Canyon, Mississippi Canyon, Viosca Knoll(slope), and Walker Ridge.

Table 3b. — Pliocene estimated oil and gas reserves for 678 proved fields by area, Gulf of Mexico, Outer Continental Shelf, December 31, 1988

(Proved reserves: oil expressed in millions of barrels at 60°F and 1 atm., gas in billions of cubic feet at 60°F and 15.025 psia.)

Area(s)	Number of reservoirs	Original recoverable reserves		Cumulative production through 1988		Remaining recoverable reserves	
		Oil	Gas	Oil	Gas	Oil	Gas
Galveston	1	0	0	0	0	0	0
High Island & Sabine Pass	14	1	128	0	66	1	62
Western Planning Area Subtotal ..	15	1	128	0	66	1	62
Chandeleur, Mobile & Viosca Knoll	11	1	211	0	0	1	211
East Cameron	64	8	399	4	221	4	178
Eugene Island	742	395	2,139	283	1,368	112	771
Grand Isle	284	310	822	258	651	52	171
Main Pass & Breton Sound	253	215	904	126	637	89	267
South Pelto	60	31	39	23	30	8	9
South Marsh Island	672	154	4,460	125	3,572	29	888
South Pass	709	705	2,218	524	1,526	181	692
Ship Shoal	595	333	2,491	236	1,657	97	834
South Timbalier	460	274	1,269	210	703	64	566
Vermilion	316	127	1,982	73	1,238	54	744
West Cameron & Sabine Pass	142	5	916	2	578	3	338
West Delta	486	525	1,078	434	707	91	371
Central Slope*	66	71	628	42	396	29	232
Central Planning Area Subtotal ..	4,860	3,154	19,556	2,340	13,284	814	6,272
Total	4,875	3,155	19,684	2,340	13,350	815	6,334

*Central Slope includes Atwater Valley, Ewing Bank, Green Canyon, Mississippi Canyon, Viosca Knoll(slope), and Walker Ridge.

Table 3c. — Upper Miocene estimated oil and gas reserves for 678 proved fields by area, Gulf of Mexico, Outer Continental Shelf, December 31, 1988

(Proved reserves: oil expressed in millions of barrels at 60°F and 1 atm., gas in billions of cubic feet at 60°F and 15.025 psia.)

Area(s)	Number of reservoirs	Original recoverable reserves		Cumulative production through 1988		Remaining recoverable reserves	
		Oil	Gas	Oil	Gas	Oil	Gas
Brazos	2	0	5	0	0	0	5
Galveston	38	1	142	0	42	1	100
High Island & Sabine Pass	40	3	478	2	295	1	183
Matagorda Island	8	0	44	0	35	0	9
Mustang Island & Padre Island	4	4	44	0	32	4	12
Western Planning Area Subtotal	92	8	713	2	404	6	309
Chandeleur, Mobile & Viosca Knoll	16	0	300	0	157	0	143
East Cameron	57	3	862	1	661	2	201
Eugene Island	418	140	2,241	98	1,623	42	618
Grand Isle	449	591	1,782	493	1,410	98	372
Main Pass & Breton Sound	471	399	2,277	247	1,349	152	928
South Pelto	283	89	681	56	397	33	284
South Marsh Island	141	50	1,654	35	1,096	15	558
South Pass	25	72	125	64	103	8	22
Ship Shoal	316	169	2,058	89	1,486	80	572
South Timbalier	604	788	1,948	656	1,215	132	733
Vermilion	228	37	3,986	22	3,169	15	817
West Cameron & Sabine Pass	150	16	1,820	11	1,462	5	358
West Delta	516	629	3,140	522	2,504	107	636
Central Planning Area Subtotal	3,674	2,983	22,874	2,294	16,632	689	6,242
Total	3,766	2,991	23,587	2,296	17,036	695	6,551

Table 3d. — Middle Miocene estimated oil and gas reserves for 678 proved fields by area, Gulf of Mexico, Outer Continental Shelf, December 31, 1988

(Proved reserves: oil expressed in millions of barrels at 60°F and 1 atm., gas in billions of cubic feet at 60°F and 15.025 psia.)

Area(s)	Number of reservoirs	Original recoverable reserves		Cumulative production through 1988		Remaining recoverable reserves	
		Oil	Gas	Oil	Gas	Oil	Gas
Brazos	230	8	2,107	4	1,079	4	1,028
Galveston	154	31	1,029	21	733	10	296
High Island & Sabine Pass	230	12	2,006	7	1,270	5	736
Matagorda Island	46	1	549	0	195	1	354
Mustang Island & Padre Island	175	5	1,238	2	412	3	826
Western Planning Area Subtotal	835	57	6,929	34	3,689	23	3,240
Chandeleur, Mobile & Viosca Knoll	9	0	136	0	0	0	136
East Cameron	153	54	2,882	40	2,395	14	487
Eugene Island	60	16	434	12	228	4	206
Main Pass & Breton Sound	65	185	862	168	648	17	214
South Marsh Island	83	89	3,260	50	2,412	39	848
Ship Shoal	2	0	10	0	0	0	10
Vermilion	173	106	5,005	73	3,961	33	1,044
West Cameron & Sabine Pass	398	100	4,173	52	3,008	48	1,165
Central Planning Area Subtotal	943	550	16,762	395	12,652	155	4,110
Total	1,778	607	23,691	429	16,341	178	7,350

Table 3e. — Lower Miocene estimated oil and gas reserves for 678 proved fields by area, Gulf of Mexico, Outer Continental Shelf, December 31, 1988

(Proved reserves: oil expressed in millions of barrels at 60°F and 1 atm., gas in billions of cubic feet at 60°F and 15.025 psia.)

Area(s)	Number of reservoirs	Original recoverable reserves		Cumulative production through 1988		Remaining recoverable reserves	
		Oil	Gas	Oil	Gas	Oil	Gas
Galveston	1	0	4	0	1	0	3
High Island & Sabine Pass	71	17	1,018	8	540	9	478
Matagorda Island	216	33	4,510	5	852	28	3,658
Mustang Island & Padre Island ...	45	1	263	0	84	1	179
Western Planning Area Subtotal ..	333	51	5,795	13	1,477	38	4,318
East Cameron	34	9	304	7	223	2	81
West Cameron & Sabine Pass	271	44	2,507	29	1,661	15	846
Central Planning Area Subtotal ..	305	53	2,811	36	1,884	17	927
Total	638	104	8,606	49	3,361	55	5,245

Table 3f. — Jurassic, Cretaceous, and Oligocene estimated oil and gas reserves for 678 proved fields by area, Gulf of Mexico, Outer Continental Shelf, December 31, 1988

(Proved reserves: oil expressed in millions of barrels at 60°F and 1 atm., gas in billions of cubic feet at 60°F and 15.025 psia.)

Area(s)	Number of reservoirs	Original recoverable reserves		Cumulative production through 1988		Remaining recoverable reserves	
		Oil	Gas	Oil	Gas	Oil	Gas
Western Slope[*]	1	0	2	0	0	0	2
Western Planning Area Subtotal ..	1	0	2	0	0	0	2
Chandeleur, Mobile & Viosca Knoll	5	0	341	0	0	0	341
East Cameron	1	0	6	0	6	0	0
Main Pass & Breton Sound	1	0	0	0	0	0	0
South Marsh Island	1	0	5	0	0	0	5
West Cameron & Sabine Pass	54	3	541	2	355	1	186
Central Slope[**]	1	6	5	0	0	6	5
Central Planning Area Subtotal ..	63	9	898	2	361	7	537
Total	64	9	900	2	361	7	539

[*] Western Slope includes Alaminos Canyon, Corpus Christi, East Breaks, Garden Banks, Keathley Canyon, and Port Isabel.

[**] Central Slope includes Atwater Valley, Ewing Bank, Green Canyon, Mississippi Canyon, Viosca Knoll(slope), and Walker Ridge.

and the Pleistocene of the High Island and Sabine Pass Area (30%). Reserves in the Mustang Island and Padre Island Areas appear limited due to poor sand conditions.

In the Central Planning Area, reserves, both proved original and proved remaining, are primarily of Pleistocene age. Within the Pleistocene, the Eugene Island Area has been the major contributor of oil (26%) and gas (27%) production. The Pleistocene of the Eugene Island Area is still the primary area for proved remaining gas reserves (9%) in the Central Planning Area. The Pleistocene of the central slope is now considered to contain, by area, the largest amount of proved remaining oil reserves (11%) in the Central Planning Area.

The Eastern Planning Area makes no contribution to Gulf of Mexico proved reserves and production. This may in part be due to the limited amount of exploratory drilling in the eastern gulf.

Reserves of Pliocene age do not make the same contribution to the Gulf of Mexico reserve base as do reserves of Pleistocene and Miocene age because of more restricted sand deposition. Pliocene reserves are significant in the Central Planning Area where considerable amounts of proved remaining oil and gas reserves exist in the Eugene Island Area, South Marsh Island Area, South Pass Area, and Ship Shoal Area.

In Figure 7 fields are assigned to the major trends (Miocene, Pliocene, and Pleistocene) based on paleontological examination. These fields are then plotted against the discovery year as defined by 30 CFR 250.11 and its

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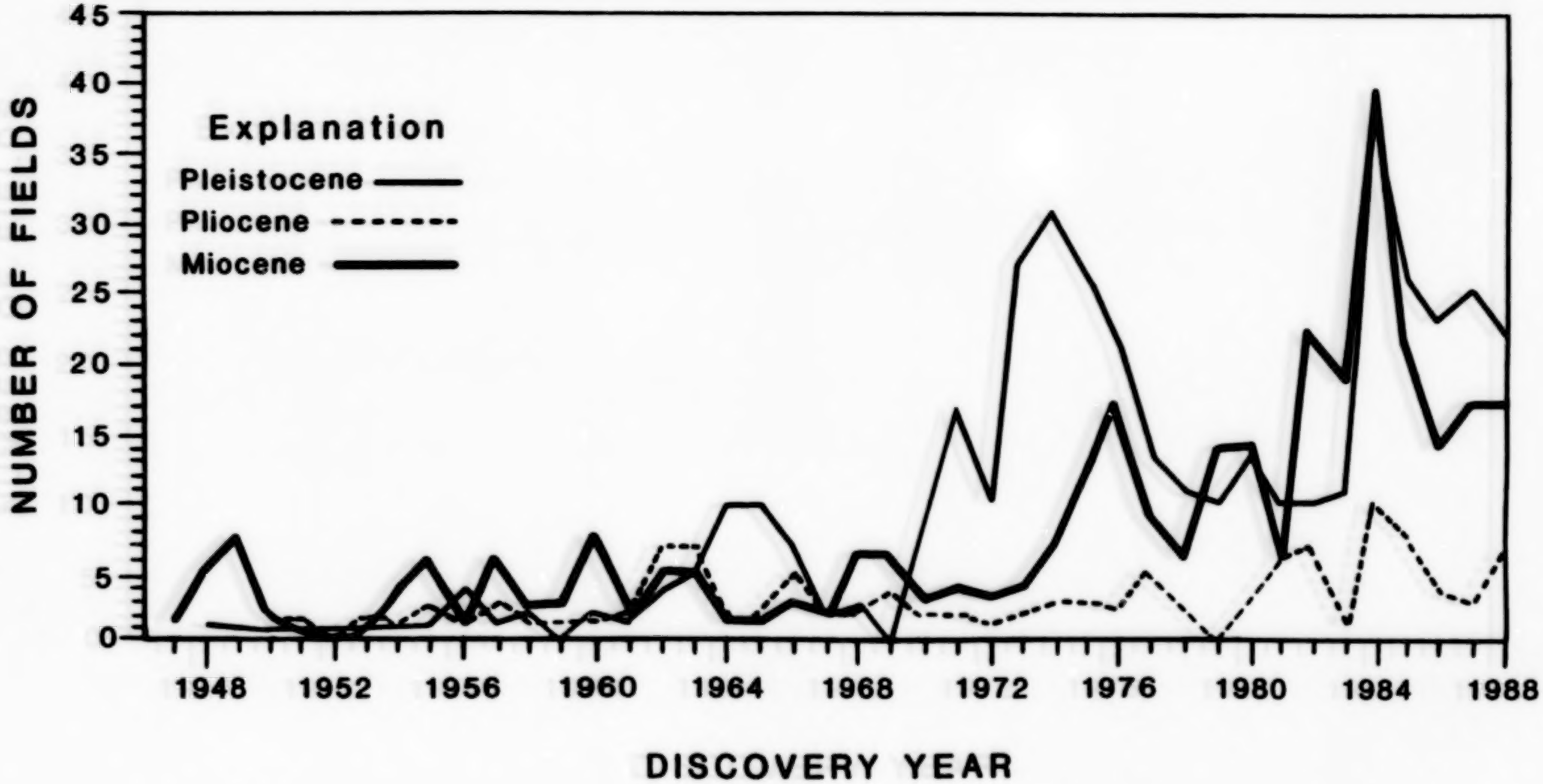

Figure 7.—Annual field discoveries by geologic age.

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predecessor, OCS Order No. 4. Through the 1960's most fields discovered in the Gulf of Mexico were Miocene in age, a trend reflecting the nearshore operating environment. With the development of deeper water technologies, the majority of field discoveries in the 1970's and 1980's were of Pleistocene age. In 1984 there was a sharp increase in the number of discoveries of fields of all ages, a development that continued through 1988. This recent trend is a result of the areawide lease offerings that commenced in May 1983 with Sale 72.

Studies Conducted

Geologic maps and reserve estimates have been completed for 500 of the 678 fields, resulting in studies of approximately 16,800 individual reservoirs. Preliminary geologic studies were conducted for another 178 fields containing an additional 955 reservoirs. A volumetric estimate was made for each reservoir, and at least one other estimation method (for example, decline curve analysis) was used for many of the reservoirs. The subsequent performances of the reservoirs are periodically compared with the original projections, and revisions to these projections are made as needed.

Each abandoned field that had production has been assigned a value for original recoverable hydrocarbons equal to the amount actually produced.

Field-Size Distribution

The distribution of original recoverable reserves based on field size is shown in Figures 8, 9, and 10. Figure 8 shows the field-size distribution of the original recoverable reserves for the 135 fields primarily producing oil, and Figure 9 shows the field-size distribution of original recoverable reserves for the 543 fields primarily producing gas. Figure 10 shows the field-size distribution of the total original recoverable hydrocarbon reserves for the 678 fields included in this report. For convenience of comparison, gas reserves are expressed in terms of barrels of oil equivalent (BOE) and added to the liquid reserves expressed in barrels. Based on the heating values of average Gulf of Mexico OCS hydrocarbons, the conversion factor used was 5,400 standard cubic feet of gas equals one BOE. A geometric progression was selected for the horizontal scales in consideration of the lognormal type of distribution.

The oil field median size (exceeded by 50 percent of the fields) is 64 million BOE (MMBOE) and the mean (average) is 106 MMBOE. The gas/oil ratio (recoverable gas divided by recoverable oil) of the 135 oil fields is 3,100 cubic feet per barrel. The largest three ranges, representing 27 oil fields, contained 60 percent of the total original recoverable reserves contained in the 135 fields. The oil field median size has greatly increased from last year's report. When the reserves definitions were changed, 17 small oil fields were eliminated from the database and are now classified as unproved.

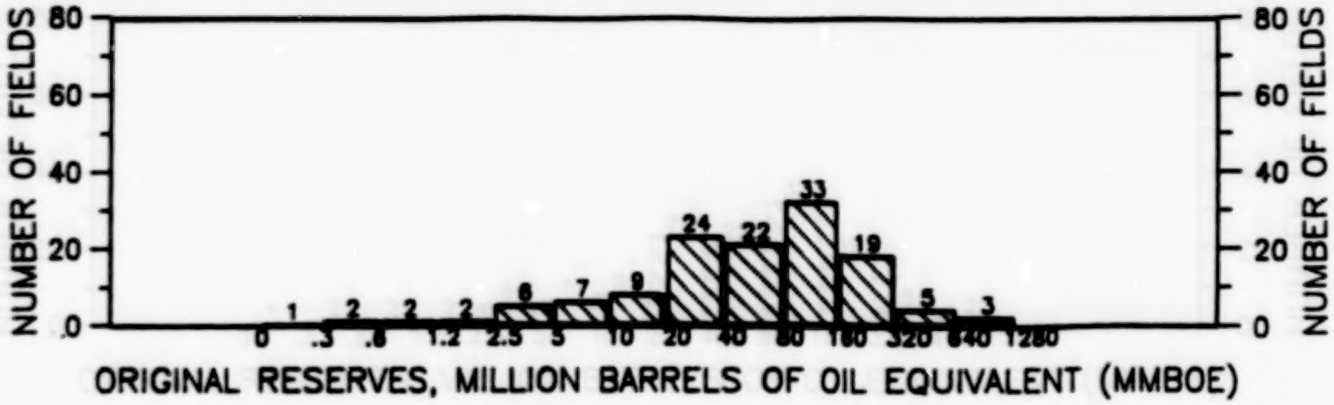

Figure 8.—Field-size distribution, 135 oil fields.

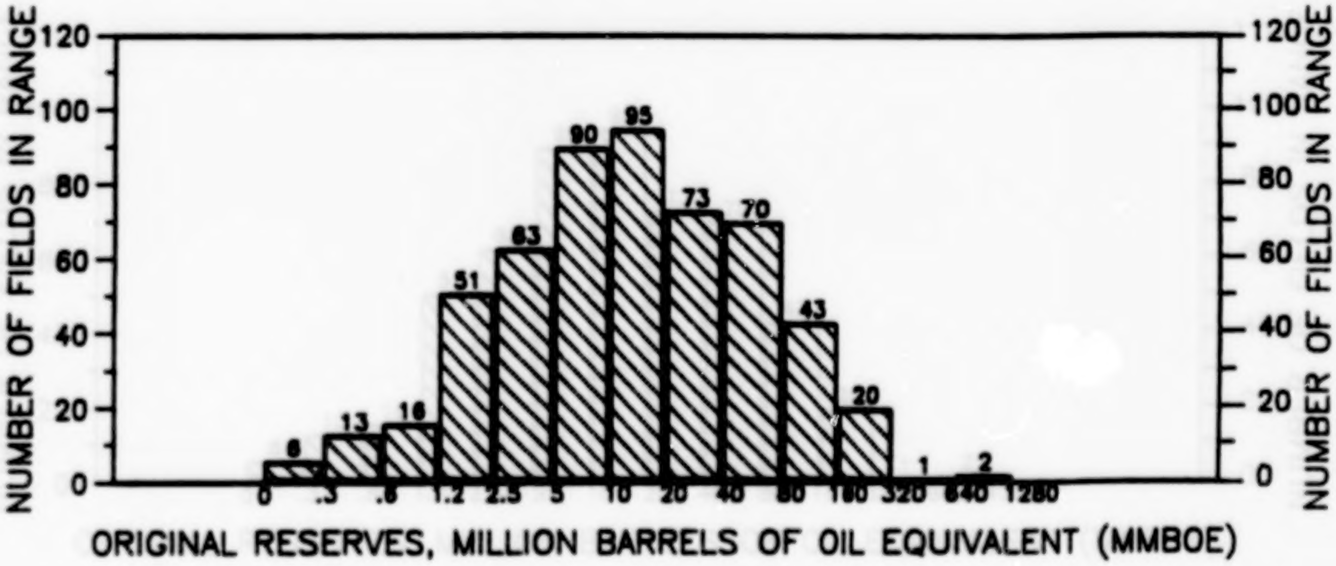

Figure 9.—Field-size distribution, 543 gas fields.

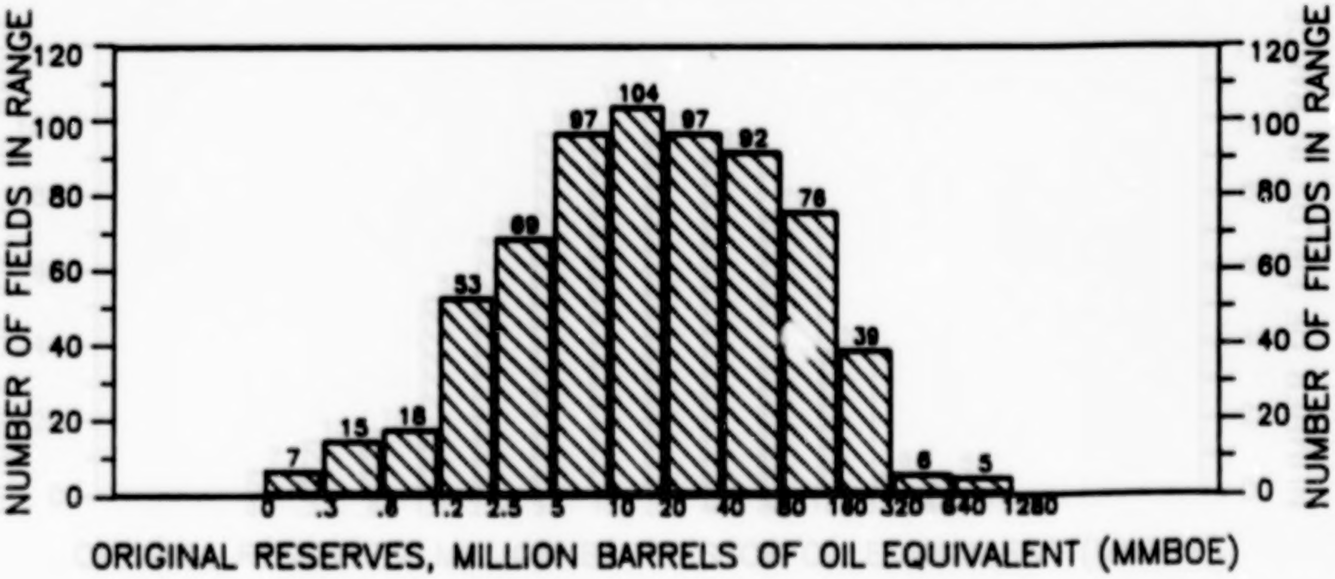

Figure 10.—Field-size distribution, 678 proved fields.

Among the 543 gas fields (Figure 9), the median is 12 MMBOE, and the mean is 37 MMBOE. The total liquid yield of the 543 gas fields is 19.4 barrels per million cubic feet. The largest three ranges, representing 23 gas fields, contained 34 percent of the total recoverable gas reserves.

Figure 10 shows the field-size distribution of the original recoverable hydrocarbon reserves of all 678 fields. The median field reserve is 17 MMBOE, and the mean is 51 MMBOE. The largest three ranges, representing 50 fields, contained 45 percent of the total recoverable hydrocarbon reserves.

Figure 11 shows the cumulative percent distribution of originally recoverable reserves in BOE by field rank for the 678 proved fields in the Gulf of Mexico OCS. As is typical of most hydrocarbon-producing basins, the distribution of field sizes in the Gulf of Mexico OCS is generally lognormal. Thus, there are a few very large fields and many small fields. Twenty-five percent of originally recoverable reserves are contained in the 20 largest fields. Fifty percent of originally recoverable reserves are contained in the 63 largest fields. Ninety percent of originally recoverable reserves are contained in the 276 largest fields.

Figure 12 shows the distribution of the number of fields and originally recoverable reserves by water depth. The originally recoverable reserves, reported in MMBOE, are associated with only the 678 proved fields. The 163 unproved active fields are presented to show current interest and development. Proved reserves in the Gulf of Mexico show a large number of reserves located in less than 200 feet of water (80%). Proved reserves

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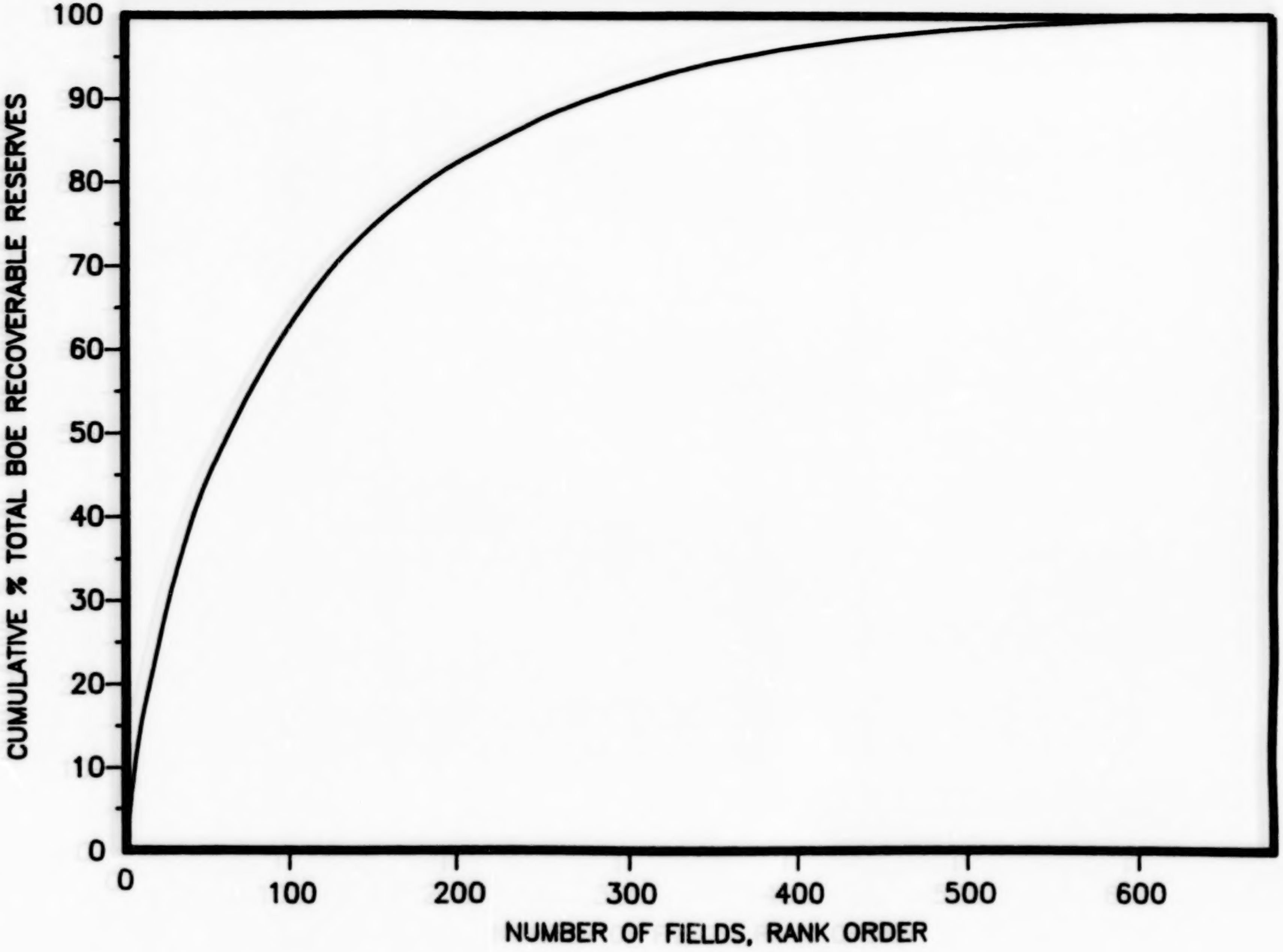

Figure 11.—Number of fields, rank order vs. percentage of total BOE recoverable reserves for 678 proved fields.

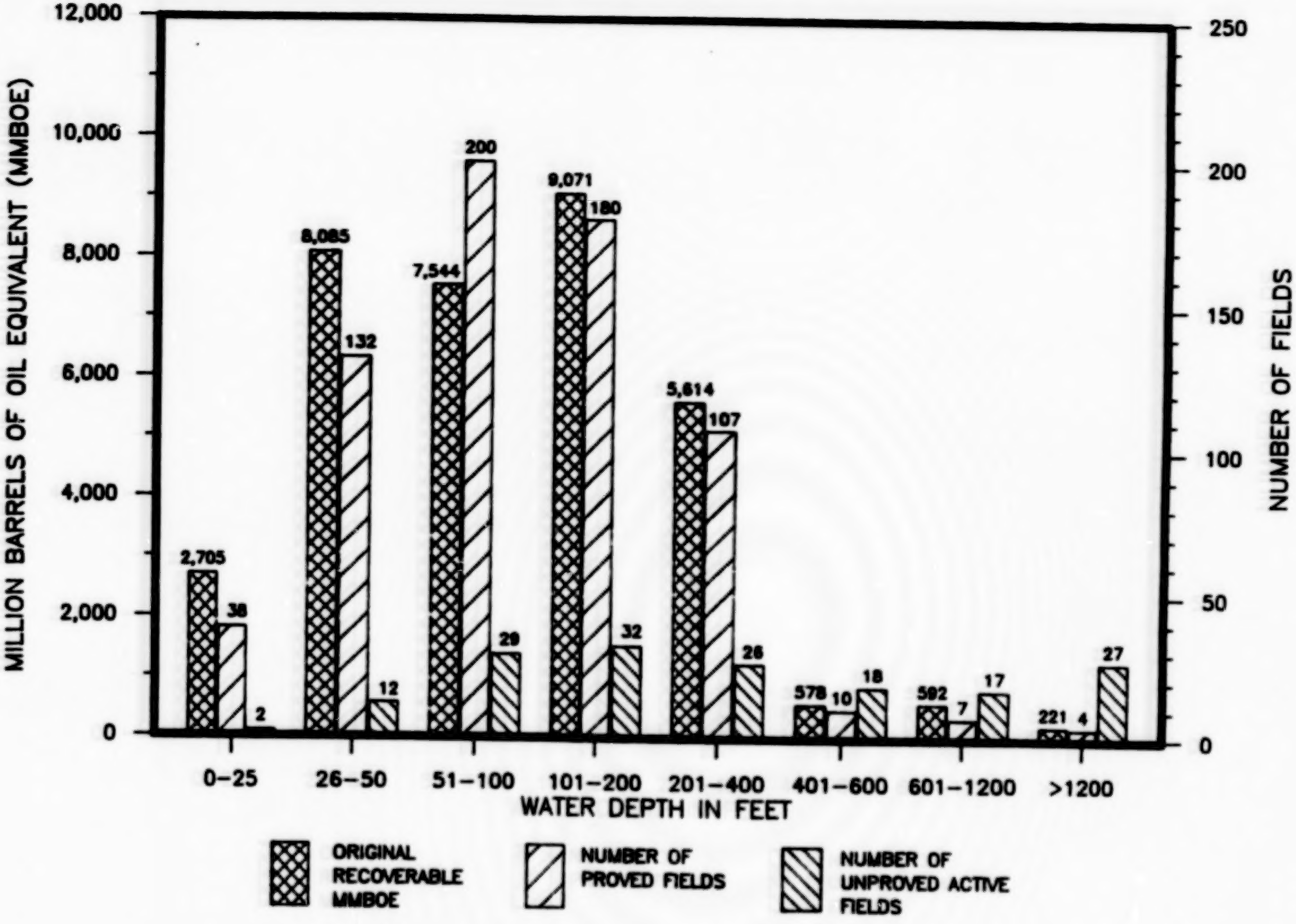

Figure 12.—Field and reserves distribution by water depth.

on the Continental Shelf (less than 600 feet of water) account for 98 percent of current proved reserves. Development on the slope (greater than 600 feet of water) reflects a sizable amount of reserves associated with a few fields. This is to be expected given the economics associated with deep-water drilling and development.

Reservoir-Size Distribution

The distribution of the various sizes of the proved reservoirs is shown in Figures 13, 14, and 15. The size ranges, which are based on original hydrocarbons in place, are presented on the logarithmic, horizontal scale. The number of reservoirs in each size grouping, shown as percentages of the total, is presented on the linear, vertical scale. Combination reservoirs (saturated oil rims with associated gas caps) are shown in Figure 13. For the combination reservoirs, gas is converted to BOE and added to the oil. Figure 14 shows the reservoir-size distribution, based on original oil in place, of proved undersaturated oil reservoirs, and Figure 15 shows the reservoir-size distribution, based on original gas in place, of the nonassociated gas reservoirs. Reservoirs for which complete data are not available are excluded.

For the 828 proved combination reservoirs (Figure 13), the median is 2.4 MMBOE and the mean is 6.2 MMBOE. The average gas/oil ratio for the oil portion of the reservoirs is 1.7 thousand cubic feet (Mcf) per barrel, and the average yield for the gas cap is 259 bbl of condensate per million cubic feet (MMcf) of gas. Figure 14 shows the reservoir-size distribution, based on original oil in place, of 4,959 proved undersaturated oil reservoirs. The median is 0.8 million barrels of oil (MMbbl), the mean is 2.3 MMbbl, and the average gas/oil ratio is 1.5 Mcf per barrel. Figure 15 shows the reservoir distribution of 7,031 nonassociated gas reservoirs. The median is 4.4 billion cubic feet (Bcf) of gas, the mean is 15.4 Bcf, and the average yield is 11.1 bbl of condensate per MMcf.

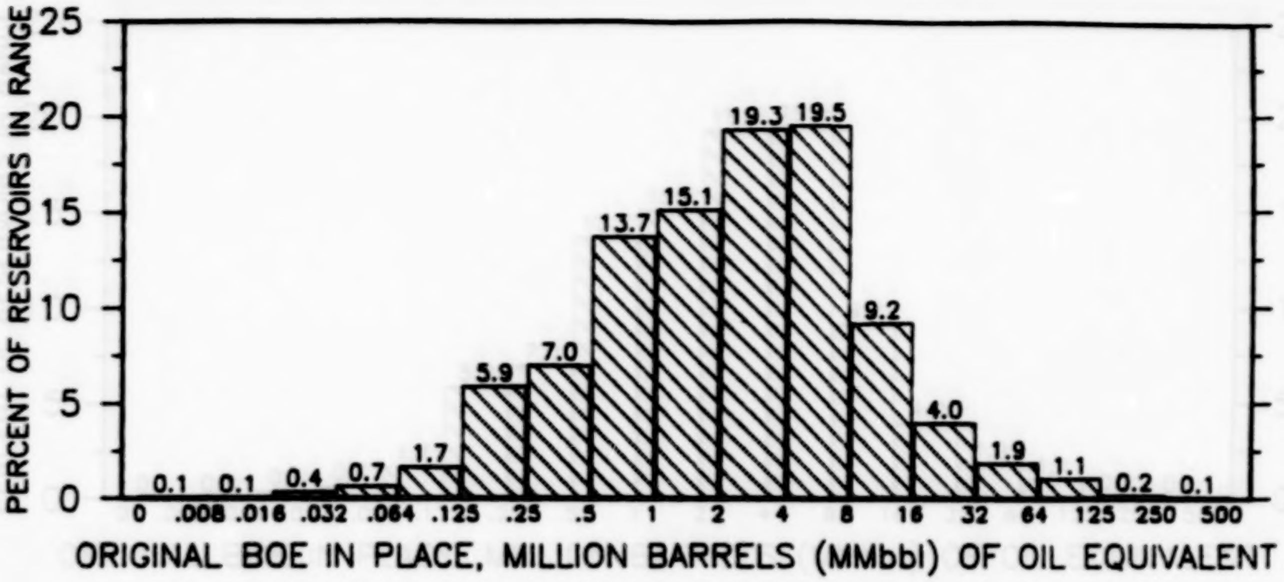

Figure 13.—Reservoir-size distribution, 828 combination reservoirs.

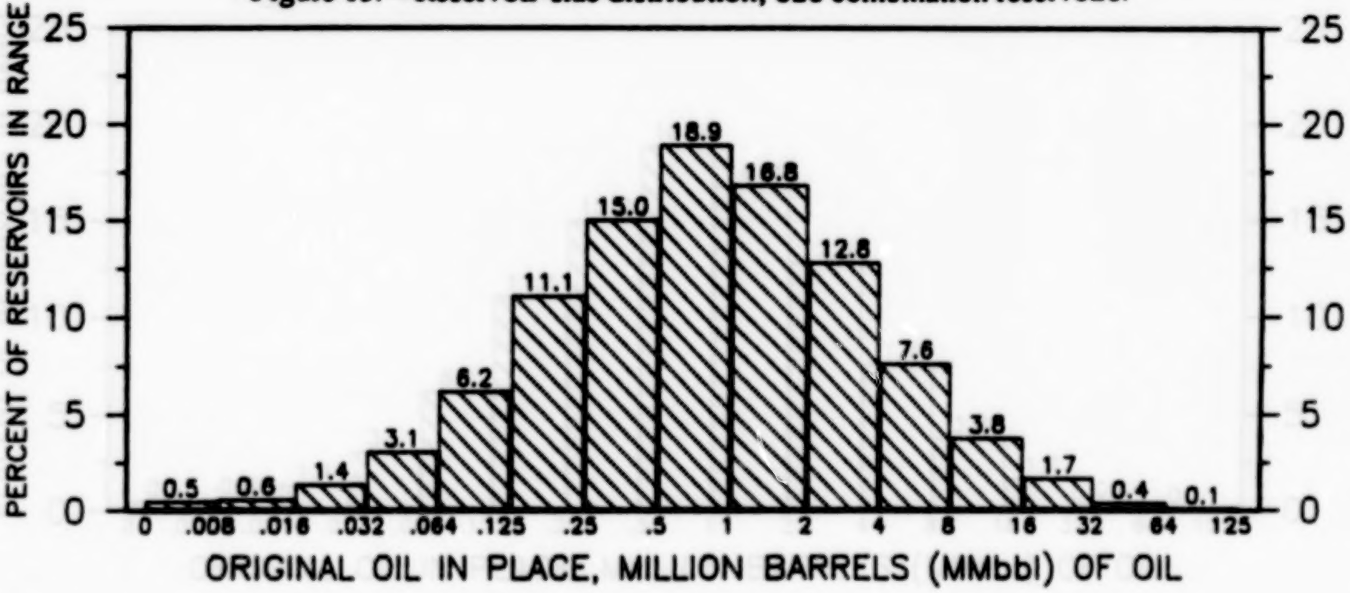

Figure 14.—Reservoir-size distribution, 4,959 oil reservoirs.

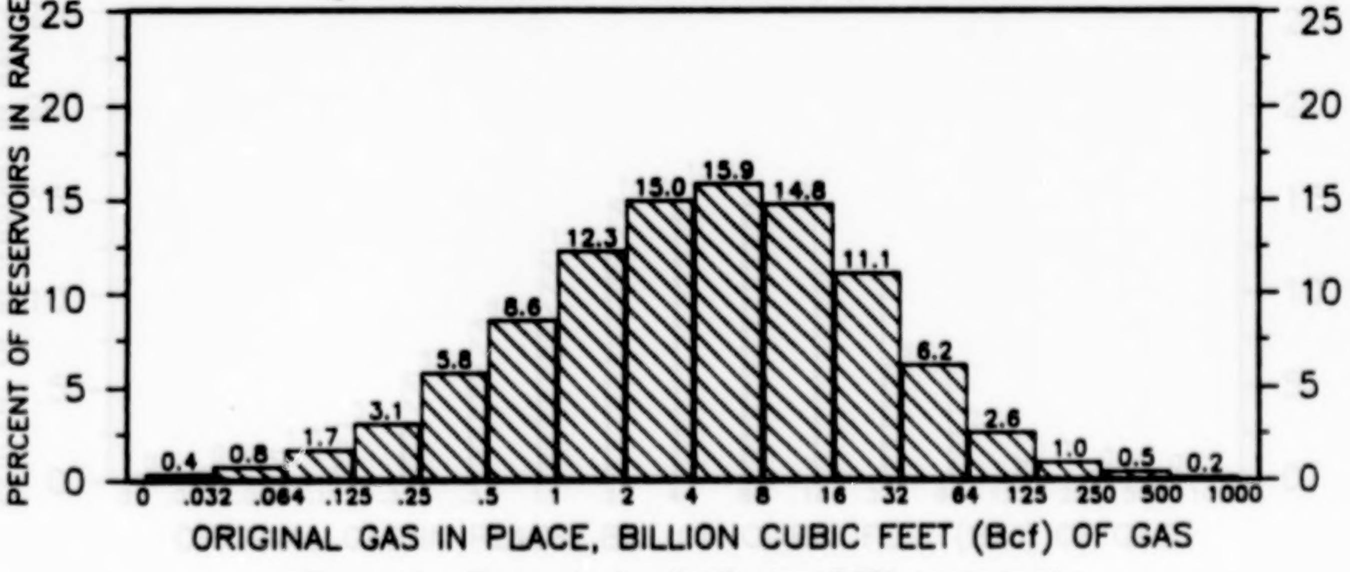

Figure 15.—Reservoir-size distribution, 7,031 gas reservoirs.

Production Rates and Discovery Trends

The average daily production during 1988 was 711,000 bbl of crude oil, 109,000 bbl of gas condensate, 1.25 Bcf of casinghead gas, and 11.30 Bcf of gas-well gas. The average gas/oil ratio of oil wells was 1.76 Mcf per barrel, and the average condensate yield from gas wells was 9.69 bbl per MMcf.

Figures 16 and 17 show monthly production-rate frequency distribution by completion as reported for the month of April 1988. Historically, production during April has closely matched the average monthly production for the year. April 1988 production was 22.1 MMbbl of crude oil and 322 Bcf of gas-well gas. Various production-rate ranges are shown on the logarithmic, horizontal scale, and the number of completions producing in that range is shown on the linear, vertical scale. To minimize the effect of test production, only those completions reported as having more than 2 days of production during the month were included. For each grouping of production rates, two numbers are presented. The larger number represents the number of producing completions in that group, and the smaller number, shown in parentheses, represents the number of continuously producing completions.

Figure 16 shows the distribution of the 3,601 oil completions producing more than 2 days during April. The median production rate is 3,076 bbl of oil per month, and the mean is 6,147 bbl per month. The analysis confirms 2,590 oil completions on continuous production during April with 112 completions averaging more than 1,000 bbl per day of crude oil

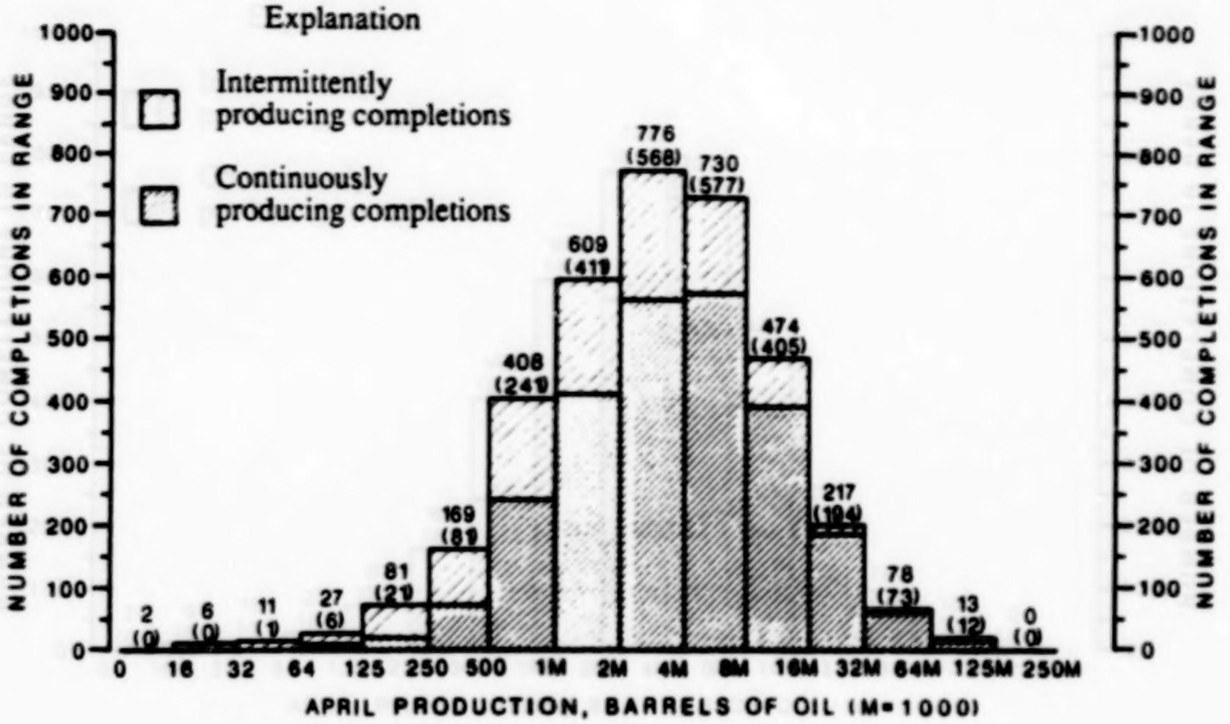

Figure 16.—Monthly production distribution,
3,601 oil completions,
(2,590) continuously producing completions.

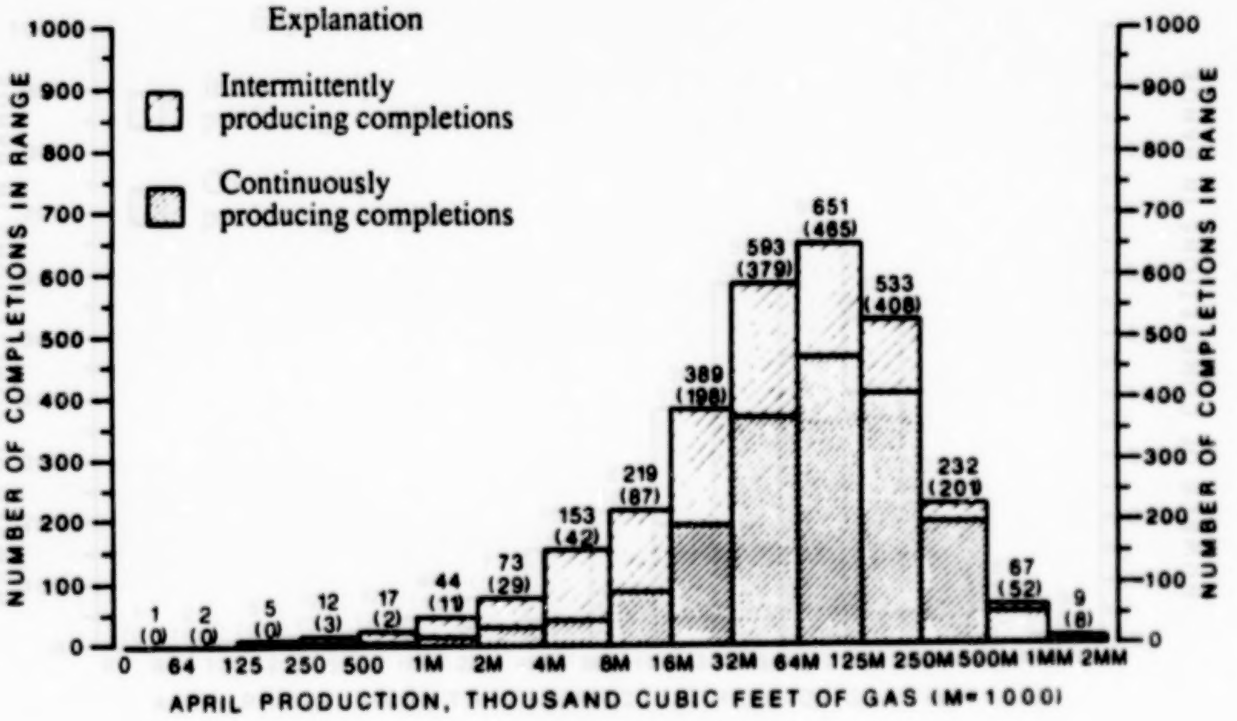

Figure 17.—Monthly production distribution,
3,000 gas completions,
(1,885) continuously producing completions.

production. The leading oil producer during April produced 96,811 bbl of oil from a Pleistocene age reservoir with a subsea depth of 10,941 feet. Figure 17 shows the rate distribution of the 3,000 gas completions producing more than 2 days. The median production rate is 63.2 MMcf of gas per month, and the mean is 108.5 MMcf per month. The study identifies 1,885 gas completions on continuous production during April, with 252 completions averaging more than 10 MMcf per day of gas production. The leading gas producer during April produced 1,291 MMcf of gas from a Pliocene age reservoir with a subsea depth of 11,095 feet.

Annual production since 1953 is shown in Figure 18. The oil plot includes condensate, and the gas plot includes casinghead gas. Oil production reached a peak of 0.38 billion barrels (Bbbl) per year in 1971 and then began an 8-year decline. Then in 1982 an increasing trend began and continued through March 1985. Since that date, the production trend has been decreasing. The 1988 annual oil and condensate production of 0.30 Bbbl is 8 percent less than the 1987 production of 0.33 Bbbl. Annual gas production reached a peak of 4.9 trillion cubic feet (Tcf) in 1981. The 1988 gas production of 4.6 Tcf increased 1 percent over 1987, but is 6 percent less than that of 1981.

Figures 19 through 22 show oil and gas reserves and production data classified by discovery date. The year of discovery assigned to a field is the year in which the first well encountering significant hydrocarbons in that field was drilled. This date may differ from the year in which the field discovery was announced. The total field reserves, as currently estimated, are allocated to the year of discovery and combined for

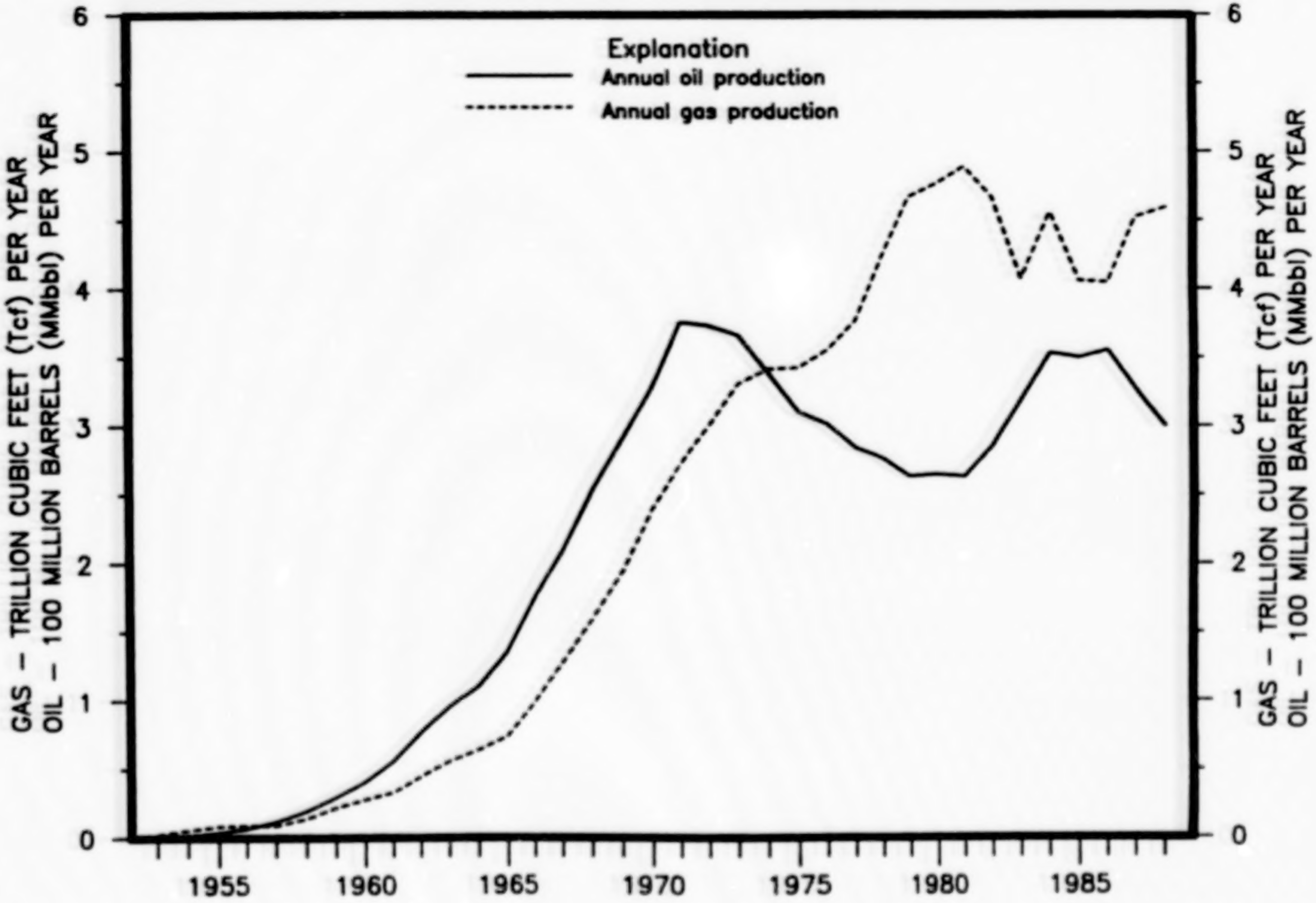

Figure 18.—Annual oil and gas production.

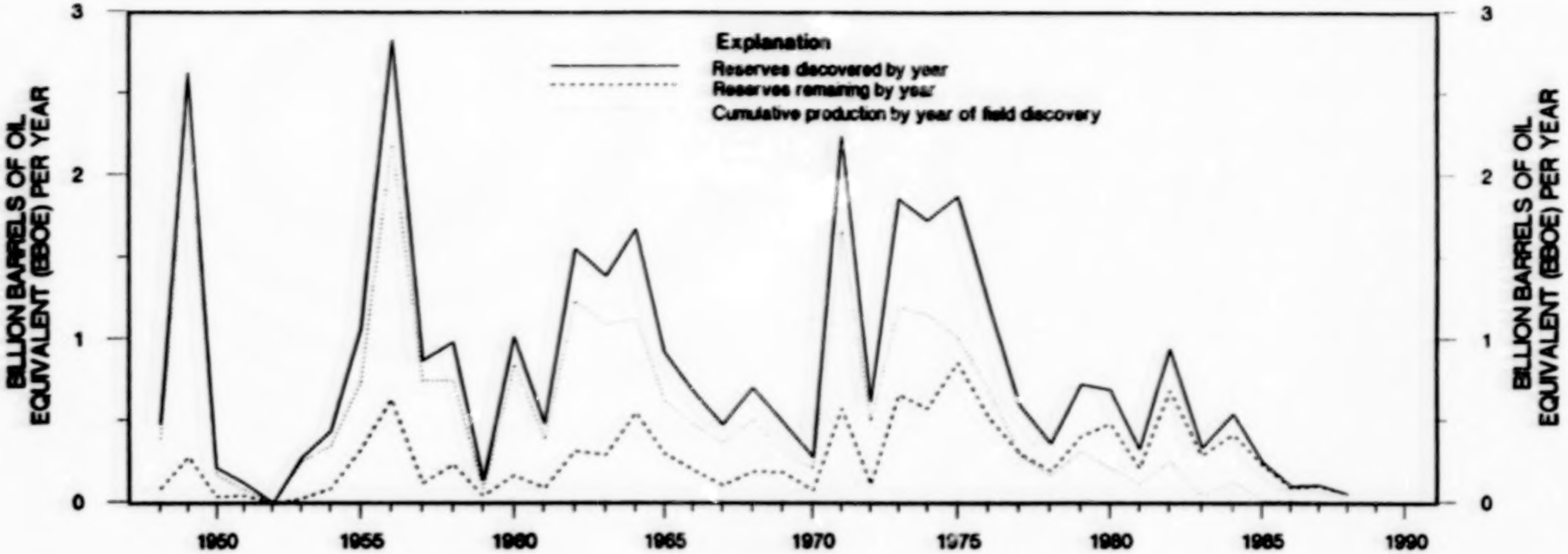

Figure 19.—Reserves and production by discovery year.

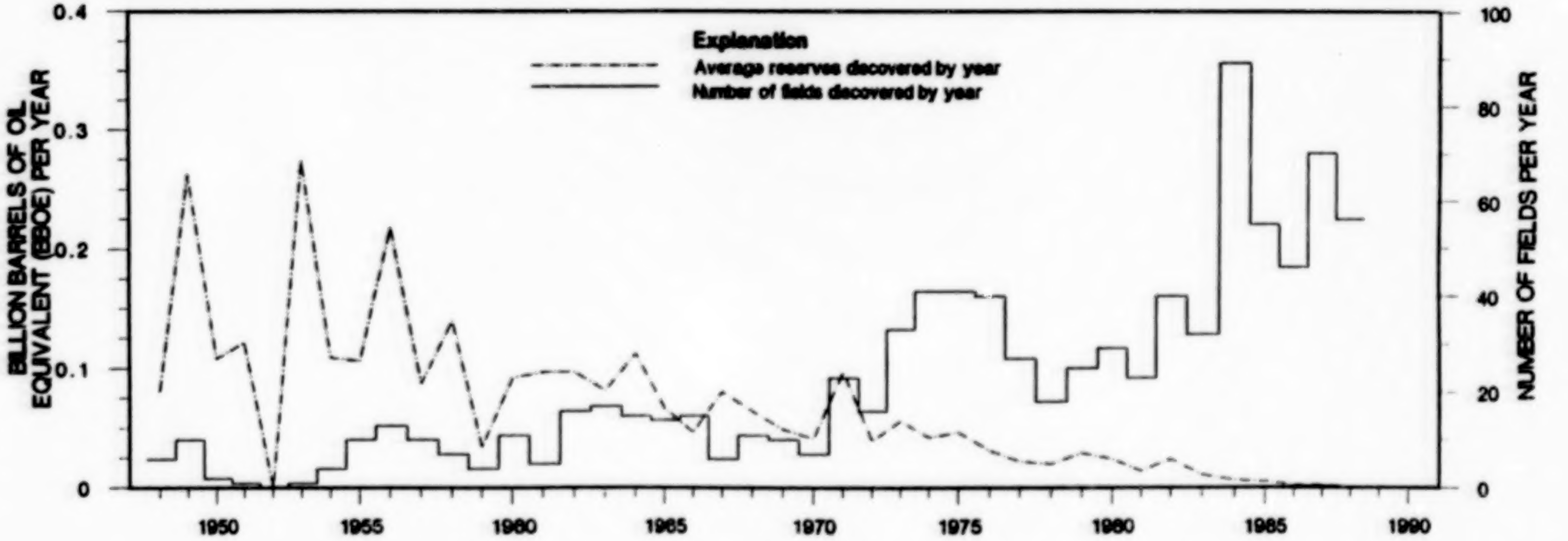

Figure 20.—Number of fields and average reserves by discovery year.

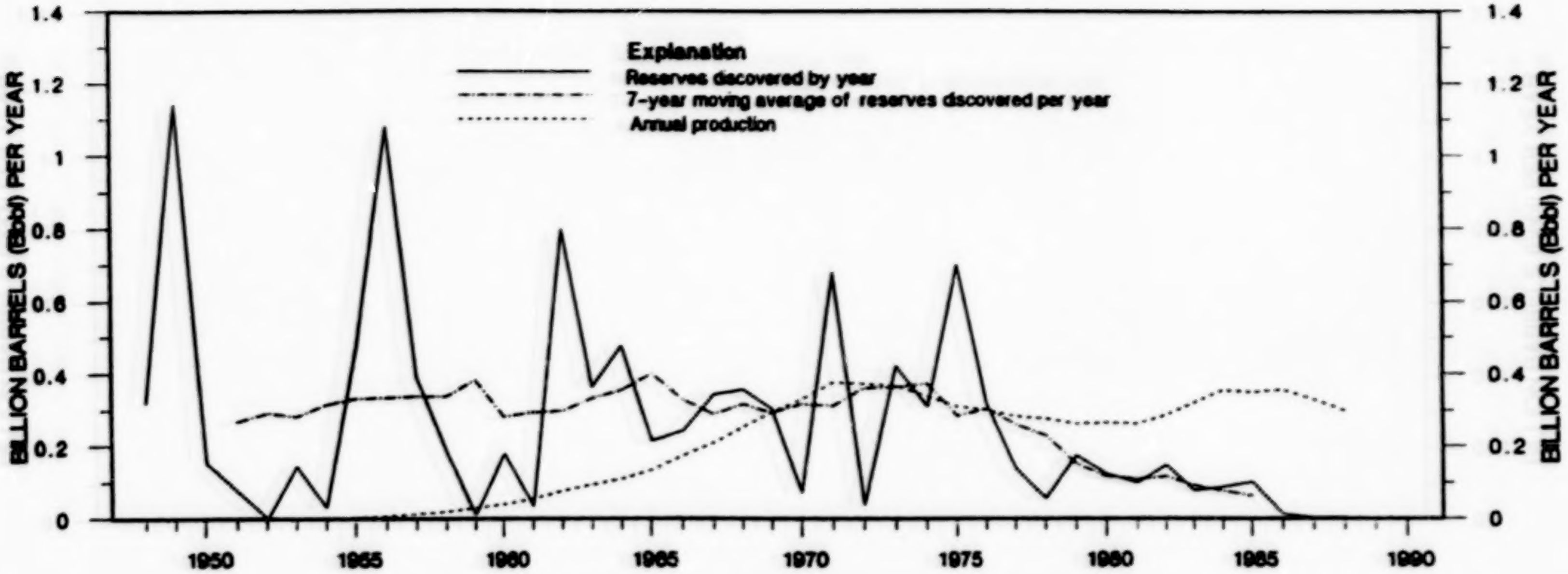

Figure 21.—Oil reserves discovered and oil production.

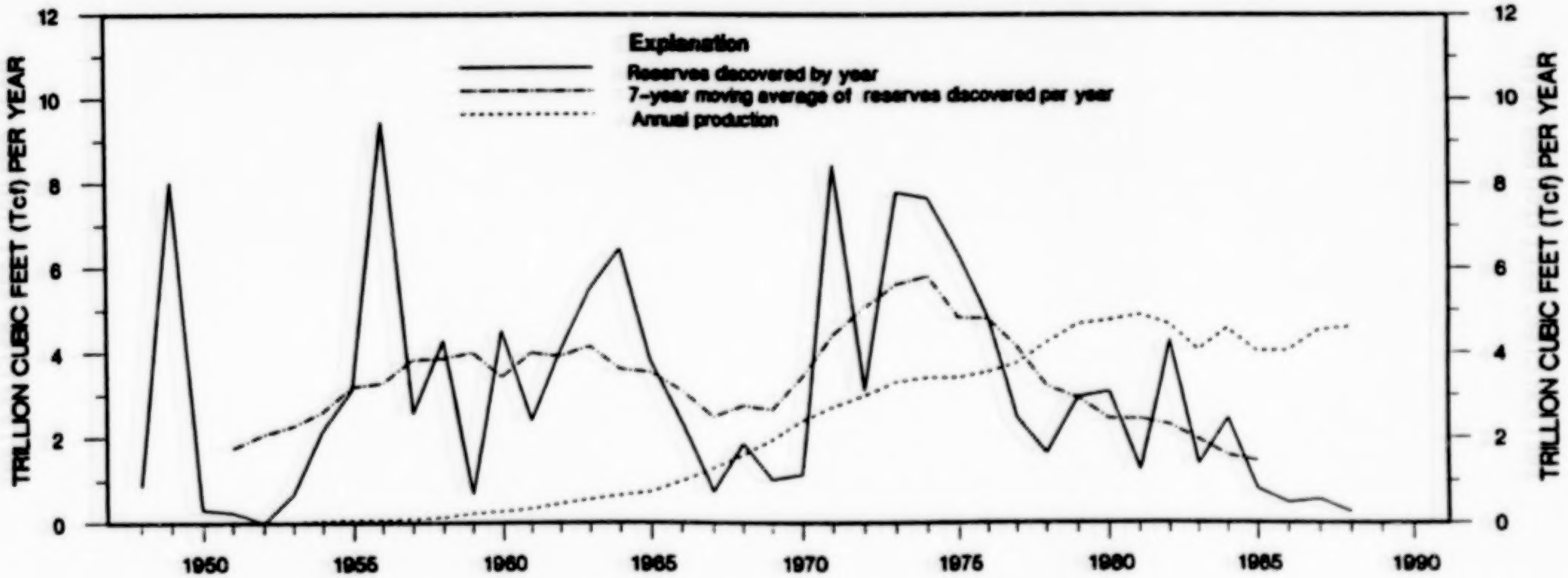

Figure 22.—Gas reserves discovered and gas production.

plotting. As a field develops, the total field reserves as previously estimated may subsequently change. Changes will be reflected by new totals on the field's discovery date. Data for recent years are presented, but field development is insufficient to permit a lasting assessment of the reserves discovered in those years.

Figure 19 presents reserves discovered, cumulative production, and reserves remaining in billion BOE as of December 31, 1988, summed according to the year of field discovery. The degree of field depletion may be estimated by the relative positions of the cumulative production curves and the reserves-remaining curves. For example, if the value of the remaining reserves is higher than the value of cumulative production for a given year, the aggregate depletion for fields discovered that year is less than 50 percent. The plot demonstrates that fields discovered after 1977 are less than 50 percent depleted.

Figure 20 presents the number of fields discovered each year and the average discovery size in BOE of fields discovered each year. The plot demonstrates a trend toward decreasing average size of discoveries over the last 25 years. The number of fields discovered by year represents discovered resources that may be proved or unproved reserves. The average reserves discovered by year are based only on proved reserves. This restriction creates an artificially low value for the last few years for average reserves discovered by year.

Figures 21 and 22 show oil and gas reserves and annual production by discovery year. Superimposed on each plot of yearly discoveries is a line depicting the 7-year moving average, which better indicates the overall trend by smoothing out the peaks. The average presented is the total of the hydrocarbons discovered in a 7-year period divided by seven and plotted for each middle year. For comparison with the rate of discoveries, the annual production of oil and gas is also shown. The annual oil production (Figure 21) has equaled or exceeded the 7-year moving average of discoveries every year since 1969 except 1974. The annual gas production (Figure 22) exceeded the 7-year moving average of gas discoveries for the first time in 1977. These two figures indicate that, since the mid-1970's, new field discoveries have not provided enough reserves to offset annual production.

All data presented in Figures 19 and 20 combine crude oil, condensate, associated gas, and nonassociated gas. All data presented in Figure 21 include crude oil and condensate, and all data presented in Figure 22 include associated and nonassociated gas.

Summary

A summary of reserve estimate changes during the year and comparisons with the estimates as of December 31, 1987, are shown in Table 4. The increase of original recoverable reserves resulting from new field discoveries (2 oil fields and 63 gas fields) is summarized and tabulated as changes to original recoverable reserves. The gas reserves added because of new discoveries are slightly higher than those added during 1987, while oil reserves added because of new discoveries are lower than last year's. Reserve estimates are revised as warranted, resulting in increases as additional wells are drilled and new leases are added to existing fields, and decreases as reservoirs are depleted and leases relinquished. Complete reevaluations of existing field studies are conducted as field development and production history indicate the need. These increases and decreases of reserve figures are summarized and presented as changes due to revisions. The net results of these revisions are increases in both oil and gas reserves.

Adjustments are needed in reconciling balances between last year's reporting method and this year's reporting method. These adjustments, shown in Table 4, are necessary because of changes in reserves definitions.

Table 4 demonstrates that the 1988 oil discoveries, adjustments, and field revisions did not exceed production, resulting in a decrease of 0.11 billion

Table 4. — Summary and comparison of oil and gas reserves as of December 31, 1987, and December 31, 1988

	Oil (billion bbl)		Gas (trillion cu ft)	
Original recoverable reserves:				
Previous estimates, as of 12/31/87 (Melancon and others, 1988)		10.76		122.1
Discoveries	+0.02		+1.5	
Revisions	+0.24		+4.2	
Adjustments	-0.07		-1.1	
Net change		+0.19		+4.6
Estimate, as of 12/31/88 (this report)		10.95		126.7
Cumulative production:				
Through 1987 (Melancon and others, 1988)		7.26		79.7
Adjustments		0.00		0.0
Through 1987 (corrected)		7.26		79.7
Production during 1988 (preliminary)		+0.30		+4.6
Through 1988 (this report)		7.56		84.3
Remaining recoverable reserves:				
Previous estimates, as of 12/31/87 (Melancon and others, 1988)		3.50		42.4
Discoveries	+0.02		+1.5	
Revisions	+0.24		+4.2	
Adjustments	-0.07		-1.1	
Production during 1988 (preliminary)	-0.30		-4.6	
Net change		-0.11		0.0
Estimate, as of 12/31/88 (this report)		3.39		42.4

barrels of remaining oil reserves. Discoveries, adjustments, and field revisions balanced with gas production, resulting in no change in remaining gas reserves.

Table 5 presents all previous reserve estimates by year.

Table 5. — Estimated demonstrated oil and gas reserves at end of year, Gulf of Mexico Outer Continental Shelf and Slope

(Demonstrated reserves: the sum of measured and indicated reserves. Oil expressed in billions of barrels; gas in trillions of cubic feet. "Oil" includes crude oil and condensate; "gas" includes associated and nonassociated gas. Remaining recoverable reserves estimated as of December 31 each year.)

Year	**Number of fields included**	**Original recoverable reserves**		**Cumulative production**		**Remaining recoverable reserves**	
		Oil	Gas	Oil	Gas	Oil	Gas
1975	255	6.61	59.9	3.82	27.2	2.79	32.7
1976	306	6.86	65.5	4.12	30.8	2.74	34.7
1977	334	7.18	69.2	4.47	35.0	2.71	34.2
1978	385	7.52	76.2	4.76	39.0	2.76	37.2
1979*	417	7.71	82.2	4.83	44.2	2.88	38.0
1980	435	8.04	88.9	4.99	48.7	3.05	40.2
1981	461	8.17	93.4	5.27	53.6	2.90	39.8
1982	484	8.56	98.1	5.58	58.3	2.98	39.8
1983	521	9.31	106.2	5.90	62.5	3.41	43.7
1984	551	9.91	111.6	6.24	67.1	3.67	44.5
1985	575	10.63	116.7	6.58	71.1	4.05	45.6
1986	645	10.81	121.0	6.93	75.2	3.88	45.8
1987	704	10.76	122.1	7.26	79.7	3.50	42.4
1988**	678	10.95	126.7	7.56	84.3	3.39	42.4

*Gas plant liquids dropped from reporting system.

**Reserves carried as proved reserves.

Conclusions

The 678 proved oil and gas fields in the federally regulated part of the Gulf of Mexico originally contained reserves estimated at 10.95 billion barrels of oil and 126.7 trillion cubic feet of gas. Remaining recoverable reserves, as of December 31, 1988, are estimated to be 3.39 billion barrels of oil and 42.4 trillion cubic feet of gas. These figures represent a 3.1 percent change in estimated remaining recoverable oil reserves and a negligible decrease in remaining recoverable gas reserves from last year's report.

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Because of the changes in reserves definitions, all fields in the Gulf of Mexico have changed categories. Prior to this report, reserves were presented as demonstrated reserves as defined in the Minerals Management Service OCS Report MMS 88-0036. Tables A1 and A3* present how reserves would have been reported if there had been no change in reserve definitions. These tables are presented only as a reference to previous years' reports. They will not be produced in any subsequent reports. Demonstrated reserves were estimated for all fields discovered before December 31, 1986 (except for 24 fields discovered in 1986 that qualified as having demonstrated reserves after the changes in reserves definitions were made). These fields were considered *studied active*, *studied depleted*, or *studied expired* in 1988. Fields discovered more recently than this were not studied.

Under the new definitions, there are 32 fields that would not have been studied that are now categorized as proved active nonproducing. These fields are estimated to contain 6 MMbbl of oil and 512 Bcf of gas. Conversely, there were 66 fields (in addition to the 24 fields reported above) that previously would have been classified as studied active that are now considered unproved active, and their reserves not reported. These 66 fields contain 61 MMbbl of oil and 1,265 Bcf of gas. These reporting changes resulted in a net reduction, compared to previous practice, of 55 MMbbl of oil and 753 Bcf of gas as reported reserves.

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*These tables are numbered to correlate with Tables 1 and 3 of the earlier estimated reserves reports. For this purpose, then, there is no Table A2.

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Table A1. — Estimated demonstrated oil and gas reserves for 866 fields by area, Gulf of Mexico, Outer Continental Shelf, December 31, 1988

(Demonstrated reserves: oil expressed in millions of barrels at 60°F and 1 atm, gas in billions of cubic feet at 60°F and 15.025 psia.)

Area(s)	Number of fields			Active with production	Original recoverable reserves		Cumulative production through 1988		Remaining recoverable reserves	
	Studied		Not studied							
	Active	Depleted/ 1988-expired			Oil	Gas	Oil	Gas	Oil	Gas
Brazos	20	3	3	16	8	2,113	4	1,079	4	1,034
Galveston	26	2	2	20	31	1,253	21	822	10	431
High Island & Sabine Pass	90	4	11	75	331	12,332	156	7,179	175	5,153
Matagorda Island	22	0	4	12	33	5,003	5	1,082	28	3,921
Mustang Island & Padre Island	19	3	5	9	10	1,557	2	528	8	1,029
Western Slope[*]	8	0	10	5	38	742	12	64	26	678
Western Planning Area Subtotal ...	185	12	35	137	451	23,000	200	10,754	251	12,246
Chandeleur, Mobile, & Viosca Knoll	24	0	7	4	1	1,236	0	157	1	1,079
East Cameron	43	7	10	36	242	8,582	172	6,505	70	2,077
Eugene Island	52	7	7	52	1,488	15,307	984	11,040	504	4,267
Grand Isle	11	3	1	10	909	3,846	757	3,102	152	744
Main Pass & Breton Sound	41	3	5	36	877	4,192	587	2,730	290	1,462
South Pelto	6	1	0	6	139	736	90	433	49	303
South Marsh Island	36	5	3	34	779	12,061	538	8,751	241	3,310
South Pass	10	0	2	9	938	2,766	666	1,884	272	882
Ship Shoal	52	3	3	47	1,294	10,792	889	7,722	405	3,070
South Timbalier	32	2	7	27	1,333	7,010	1,036	4,434	297	2,576
Vermilion	59	5	7	57	504	14,747	316	10,867	188	3,880
West Cameron & Sabine Pass	85	6	6	77	191	16,221	110	11,776	81	4,445
West Delta	20	0	2	18	1,232	4,635	1,027	3,481	205	1,154
Central Slope[**]	29	5	25	8	626	2,314	190	671	436	1,643
Central Planning Area Subtotal ...	500	47	85	421	10,553	104,445	7,362	73,553	3,191	30,892
Eastern Planning Area Subtotal[***].	0	0	2	0	0	0	0	0	0	0
Subtotal	685	59								
GOM TOTAL	744		122	558	11,004	127,445	7,562	84,307	3,442	43,138

[*] Western Slope includes Alaminos Canyon, Corpus Christi, East Breaks, Garden Banks, Keathley Canyon, and Port Isabel.

[**] Central Slope includes Atwater Valley, Ewing Bank, Green Canyon, Mississippi Canyon, Viosca Knoll(slope), and Walker Ridge

[***] Eastern Planning Area includes Charlotte Harbor, Destin Dome, Pensacola, Pulley Ridge, and others.

NOTE: Reserves reported this year are for all fields, in order that there be consistency between the old and new methods.

Table A3. — Estimated demonstrated oil and gas reserves for 744 fields by geologic age, Gulf of Mexico, Outer Continental Shelf, December 31, 1988

(Demonstrated reserves: oil expressed in millions of barrels at 60°F and 1 atm; gas in billions of cubic feet at 60°F and 15.025 psia)

Geologic Age	Original recoverable reserves		Cumulative production through 1988		Remaining recoverable reserves	
	Oil	Gas	Oil	Gas	Oil	Gas
Western Planning Area						
Pleistocene	337	9,547	151	5,118	186	4,429
Pliocene	0	128	0	66	0	62
Upper Miocene	8	712	2	404	6	308
Middle Miocene	57	6,808	34	3,689	23	3,119
Lower Miocene	49	5,799	13	1,477	36	4,322
Other*	0	6	0	0	0	6
Western Planning Area Subtotal	451	23,000	200	10,754	251	12,246
Central Planning Area						
Pleistocene	3,774	41,098	2,295	28,740	1,479	12,358
Pliocene	3,180	19,734	2,340	13,284	840	6,450
Upper Miocene	2,987	22,828	2,294	16,632	693	6,196
Middle Miocene	549	16,698	395	12,652	154	4,046
Lower Miocene	52	2,812	36	1,884	16	928
Other*	11	1,275	2	361	9	914
Central Planning Area Subtotal	10,553	104,445	7,362	73,553	3,191	30,892
Eastern Planning Area Subtotal	0	0	0	0	0	0
Total	**11,004**	**127,445**	**7,562**	**84,307**	**3,442**	**43,138**

*Other includes Jurassic, Cretaceous, and Oligocene

Actual reserves in the Gulf of Mexico have not decreased by these amounts; rather the MMS is now reporting reserves that are less speculative.

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